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FURTHER STUDIES ON DIABETES MELLITUS

by

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COMMUNITY HEALTH CELL

Report No. VKYOCTAS / 84 / 012

Further Studies on Diabetes Mellitus

by

Dr. R. NAGARATHNA* & Dr. H. R. NAGENDRA**

ABSTRACT : 6 months to 4½ years follow up studies on 52 patients and 2–4 weeks follow up studies on 82 patients with integrated approach of yoga therapy has been presented in this report.

A review of the diet considerations useful for diabetics has been presented.

The short term (2–4 weeks) studies included 73 adult onset type (NIDDM) and 9 Juvenile (IDDM) onset type of diabetics. The assessments done before and after the yoga practices showed significant improvement in all subjective parameters like excess hunger, general weekness, urinary frequency and also in objective parameters namely medication score, weight, urinary sugar, 2 hr. post prondial blood sugar (PPBS), blood cholesterol pulse rate (PR), respiratory rate (RR) and BP. There was no significant variations in the calorie content of their daily diet during the programme. The significant reduction in PPBS seen in both the 'weight reduction' and 'no change in weight' groups, is similar to our earlier observations (4).

6 months to 4½ years follow up of 49 adult onset type of D.M. showed highly significant reduction in medication score and PPBS in those who had practised yoga regularly for 12 to 54 months and non significant change in the irregular and yoga discontinued categories.

There was no significant improvement in Juvenile diabetics in either the short term or long term studies.

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INTRODUCTION

Diabetes Mellitus (DM) has become one of the health hazards of modern era. While Hypertension, Heart attacks, Angina etc., scare a modern man, Diabetes also causes great concern in him. Once he gets any of them, he is stuck with these ailments for life. That is what the modern medical world believes today. Further, the medical experts know that there is no positive cure for DM and other psychosomatic and psychiatric problems of the modern era as of today.

The role of diet and exercise is well known in diabetes. Beneficial effect of dieting has been well documented in handling diabetes and diet control has become the first line of treatment. Many mild diabetics have found themselves completely rehabilitated, thanks to the right understanding of the role of dieting. Modern sedentary life has been recognised as one of the main factors in the worsening of the diabetic state. Physical exercise, hence, has its beneficial role in dealing with DM. However, medium and severe diabetics have to resort to oral hypoglycaemic drugs and/or insulin administration. However the Juvenile type of diabetics are the insulin dependent type and only diet and exercise are insufficient for controlling their diabetic state in most cases.

Yoga is being examined scientifically over the last decade for its efficacy in the treatment and rehabilitation of DM. Swami Kuvalayananda and his co-workers in their basic pioneering work on yogic practices have shown that yogic physical culture (asanas, pranayama, kriyas etc.) tend to bring to normalcy the total body fats (measured in terms of skin folds and blood cholesterol) and restore the autonomic balance. These physiological, psychological, biochemical and neurophysiological changes recorded by them (2) scientifically during asanas, pranayama and kriya practices form the basic scientific work in the field of yoga. This scientific trend has triggered the interest of many workers to examine yoga with a scientific eye and not just to continue yoga with a blind faith shrouded with many associated misconceptions and mysticism.

The initial efforts in treating diabetics by yoga centered around the use of yogasanas (4,6). The results were quite encouraging in rehabilitating mild diabetics probably faster than physical exercises (4). Later we find the use of kriyas along with asanas (3, 8, 9) used with greater benefits and helpful in recording significant improvements even in moderately severe diabetics (9) and marginal or no effect on severe and juvenile type diabetics.

Use of Transcendental meditation (TM) - a standardised meditation technique has shown signs of significant improvements even in Juvenile offenders (1). The work of Swami Satyananda Saraswati and his co-workers has established a further trend to use asanas, pranayama, kriyas and meditation (7) in dealing with DM and other psychosomatic ailments like Asthma etc.

An integrated approach of yoga therapy formulated by culling out the information from the Upanishads and yogic texts was presented by us and applied as a tool in handling many of the modern psychosomatic and psychiatric problems. (11) This approach adopted for diabetes mellitus has been described in our earlier works (4).

Therein, the results on 49 patients with established diabetes treated for 2 weeks have shown significant statistical improvements. Even the group with no change in weight showed a significant decrease in the level of the PPBS (2 hrs.) indicating that the results may not be simply due to the reduction in weight.

In this report, we present our further studies using this integrated approach. The studies on diet form the first part of the report. Later the results from 2 weeks to 4 weeks on different category of diabetics are presented. Results from psychological tests conducted on some patients are also reported. Finally the results from follow-up studies for 2 years are recorded.

2. DIETETIC CONSIDERATIONS

2.1 Preliminary Remarks: The food that we eat is assimilated in the body and is used for the growth and maintenance of tissues (10). Plants can manufacture the food they need from simple chemicals derived from soil, water and from the carbon dioxide of the air. Higher organisms, do not possess this capacity to manufacture food from simple chemicals and hence they depend on plant life or on other animals for obtaining the food they need.

Man has a number of food stuffs to choose from to make up his diet. The health of a person is closely associated with the type and quantity of food stuffs he chooses to eat and to satisfy his hunger. Dietary habits in different regions of the world have been determined mainly by the local availability of foods and dietary patterns necessary to sustain reasonably good health have perhaps been evolved after a good deal of trial and error. However, the scientific knowledge accrued over the last few decades has helped to reschedule the diet patterns for sustaining healthy and vigorous life. A brief outline of the general principles and considerations, based on the above understandings, that govern the planning of satisfactory diets for normal persons and for diabetics, has been sketched in this section.

2.2 The principles: Food stuffs may be broadly classified as cereals, pulses, nuts and oilseeds, vegetables, fruits, milk and milk products and flesh foods. These foods contain substances known as nutrients and it is for obtaining these nutrients which perform various functions in the body that food is consumed daily by any common living organism. The nutrients include proteins, fats. carbohydrates, vitamins and mineral salts. They are present in almost all foods in varying proportions and depending on the relative concentrations of the nutrients contained, foods are classified sometimes as protein-rich foods, carbohydrate-rich foods, etc. Oil, ghee, etc., provide mostly fat, while sugar is purely a source of carbohydrates.

Proteins, fats and carbohydrates are also sometimes called "proximate principles". They are oxidised (i.e. burnt) in the body to provide the energy required for the various activities of life. Together with water, which is also a necessary dietary element, proximate principles form the main bulk of foods.

Vitamins and mineral salts do not supply energy, but they play an important role in the regulation of several essential metabolic processes in the body. Some minerals are also important components of the body structures like bones and teeth.

A well balanced diet should contain all these factors in correct proportions and in adequate amounts. Such a diet should be of sufficient quantity to provide the needed energy and also ensure atleast a minimum supply of the essential nutrients to maintain the life processes in proper working order. The role of various nutrients in living systems and their nutritive value has to be understood before we plan to present a need based diet schedule. Hence a brief summary is presented below.

TABLE 2.2

Coefficients for energy calculations

Adult male* (sedentary worker)	1.0
Adult male (moderate worker)	1.2
Adult male (heavy worker)	1.6
Adult female (sedentary worker)	0.8
Adult female (moderate worker)	0.9
Adult female (heavy worker)	1.2
Adolescents – 12 to 21 years	1.0
Children – 9 to 12 years	0.8
Children – 7 to 9 years	0.7
Children – 5 to 7 years	0.6
Children – 3 to 5 years	0.5
Children – 1 to 3 years	0.4

* Adult male 55 kg. body weight

(i) Proteins :

Proteins are the chief substances in the cells of the body, they form the important constituents of muscles and other tissues and of vital fluids like blood. Proteins supply the building material for the body and make good the wear and tear of tissues, which is a constant feature of the process of life and it is for this reason that foods rich in protein are often called "body building foods". Several substances concerned with vital life processes – e.g. "enzymes" which help in the digestion of food, and "anti bodies" which are body defences against infections – are also mainly protein in nature. Proteins are, therefore, one of the most important nutrients and the sufficiency of protein in a diet is an important measure of the adequacy and quality of the diet. Proteins are also oxidised in the body to provide energy, but such use of protein is costly and wasteful. It is better that most of the calorie requirement is met from carbohydrates and fats so that proteins are spared to fulfil other functions essential to life.

Most foodstuffs contain protein, but in widely varying amounts. Animal foods such as meat, fish and eggs are rich in protein and milk can also be considered to be rich in protein if due allowance is made for the large amount of water present in it. Among the vegetable foods, pulses and nuts are the richest sources of protein with amounts often exceeding those present in animal foods. Soyabean is unique in this respect as it contains over 40 percent protein. The common cereals such as rice and wheat are relatively poor sources of proteins. However, considering the amounts of these foods that are normally consumed daily, their contribution to the total protein intake by an individual is considerable. Rice contains less protein than wheat does, but the protein of rice is of better quality. The outer layers of cereals are richer in protein than the inner starchy kernel, and hence when wheat or rice is highly milled, there is some loss of protein as well as of other valuable nutrients such as vitamins and mineral salts. Leafy and root vegetables and fruits are very poor sources of protein.

In addition to the quantity of protein in a diet, the nutritional quality of the

proteins also matters in judging the protein value of a diet. Proteins present in various foods differ in their nutritive value on account of the differences in the amino-acid composition. Amino-acids are the "bricks" with which tissue protein is built and replaced, and therefore the more closely the amino-acid make up of a protein resembles that of the tissues, the greater is its value.

There are about twenty amino-acids commonly found in dietary proteins. It is possible for the body itself to obtain its requirements of some of these amino-acids by mutual inter-conversion among the amino-acids and from non-protein sources. However, about ten amino-acids cannot be synthesized by the body, and hence have to be supplied through the diet. These amino-acids are therefore called "essential amino-acids", and it is the extent of the presence of these essential amino-acids that largely determines the quality of a protein. The proteins of whole egg and human milk are considered the best among food proteins, and the pattern of essential amino-acids in these foods is usually taken as standard against which the amounts of essential amino-acids present in other foods can be compared. Though the proteins in foods of plant origin are not so well balanced individually, a judicious combination of cereals and pulses can provide a well balanced diet.

Another factor to be considered in assessing the value of the proteins of a foodstuff is their digestibility. In general, proteins of uncooked vegetable foods especially pulses are less digestible than those of animal foods. Cooking improves the digestibility of several foods.

Thus nutritive value of a protein depends on its essential amino-acid make up and its digestibility.

(ii) Fats :

Fat is a concentrated source of energy and it supplies per unit weight more than double the energy furnished by either protein or carbohydrate. Some fats, especially vegetable oils, provide what are called " essential fatty acids " – linoleic and arachidonic acids – to the body. Like vitamins, the essential fatty acids also play a role in several metabolic reactions.

The fat content of a normal diet is made up mostly of the pure fats and oils consumed as such. However, the foodstuffs that are rich in fat are oilseeds and nuts, soyabean and avacado pear. Cereals, pulses and vegetables contain negligible amounts of fat.

Diets in which fats supply more than 30% of the calories in the diet may result in an increase in blood cholesterol. This is especially true for persons leading a sedentary life.

Some fats like groundnut oil, sesame oil or sunflower oil which contain a high proportion of polyunsaturated fatty acids do not increase blood cholesterol levels very much even when consumed in large quantities. On the other hand, certain fats like butter, ghee, coconut oil and hydrogenated vegetable fats (vanaspati) which contain a high proportion of saturated fatty acids have been shown to cause considerable elevation in the levels of blood cholesterol when consumed in large amounts.

In addition to the quantity and quality, the mode of consumption of fat also appears to influence the cholesterol content

of blood. At the same total quantity of daily intake, consumption of smaller amounts of fat a number of times during the course of the day has been shown to cause less elevation of cholesterol content as compared to consumption of large amounts of fat at a time.

(iii) Carbohydrates:

Carbohydrates are a class of substances which include glucose, cane sugar, milk-sugar, starch, etc. Grain foods are largely composed of starch, and food-stuffs like cane sugar and glucose are pure carbo-hydrates. They form the main source of energy to the body. Being a cheap source of energy, carbohydrates form the bulk of an Indian diet.

Besides starch and other digestible carbohydrates mentioned above, many foods contain celluloses and hemicelluloses which are also carbohydrates. These types of carbohydrates, also called "fibre" or "roughage", however, are not digested in the human digestive system and are voided as such. Though contributing little to the nutritive value of foods, the presence of roughage in the diet is necessary to the mechanics of digestion and elimination of wastes. The contraction of the muscular walls of the digestive organs is stimulated by the fibre, thus counteracting the tendency to constipation. Vegetables, particularly the leafy ones, fruits, condiments and spices are comparatively rich in fibre, while cereals, root vegetables and other foods are relatively poor sources.

In working out diet schedules, the requirements of proteins, fats, vitamins and minerals should be first considered and carbohydrate rich foods can then be included in the diet in sufficient amounts to meet the energy needs.

2.3 Energy requirements: The amount of energy needed when the body is at rest (both physically and mentally) is termed Basal Metabolism. Age, sex, height, weight and state of nutrition are some of the factors which influence it.

Manual work, light or heavy, calls for additional energy. So does the mental activity. Total energy including that for the basal metabolism and other activities is supplied by the food we eat. While enough food should be provided to avoid impaired powers and low level of working efficiency, quality of food also is of importance.

Quantitative food requirements are usually estimated in terms of heat units – calories. A physiological calorie (also called Kilocalorie – Kcal) is the amount of heat necessary to raise the temperature of one kilogram of water by one degree centigrade.

The energy value of a foodstuff can be determined by employing an instrument called 'Bomb calorimeter', or it can be more easily calculated from the analysis of foods for protein, fat and carbohydrate and by multiplication of the values with the appropriate factors. One gram of carbohydrate or protein yields 4 calories while one gram of fat yields 9 calories.

The calorie consumption of an average adult male doing sedentary work is defined as one unit; the calorie requirements for others can be worked out using the coefficients given in Table 2.2., Table 2.3 gives the energy values of various food stuffs.

TABLE 2.3

CALORIES IN DIETS

Cereals & Cereal Products:	Qnty.	Cal.
Bajra	100 gms.	361
Maize flour	,,	355
Maize tender	,,	125
Corn flakes	,,	95
Pop corn	50 gms.	170
Ragi	100 gms.	328
Rice raw, melted	,,	345
Rice puffed	,,	325
Rice cooked	60 gms.	70
Sago	100 gms.	351
Wheat flour (atta)	,,	341
Chapati	med. 35 gms.	119
Bread white	1 slice	60
Idli	1 medium	100
Dalia sweet	1	215
Bun	1	280
Cheeroti	1	240
Paratha	1	275
Rawa Uppittu		56
Sugar:		
Jaggery	15 gms.	57
Jam	5 gms.	20
Sugar powder	1 tablespoon	45
Black gram (Udad dhal)	100 gms.	347
Lentil (masur)	,,	343
Soyabeans	,,	432
Rasam	1 cup	12
Pulses:		
Bengal gram	100 gms.	369
Chana dhal	,,	372
Rajmah	,,	346
Dal cooked	92 gms.	92
Sambar	½ cup	105
Honey	1 tea spoon	30
Sugar	,,	16

Fats & Oils:	Qnty.	Cal.
Butter (processed)	100 gms.	755
Ghee	,,	900
Margarine (sunbean)	,,	755
Cream	,,	213
Oil	,,	900
Vanaspati	,,	900
Milk & Milk Products:		
Cow's Milk	1 cup	100
Milk condensed	1 cup	320
Cheese	100 gms.	348
Kheer (payasam)		178
Buffallo milk	,,	115
Milk condensed	20 gms.	64
Curds	100 gms.	60
Milk cake		331
Nuts:		
Almond	10 gms.	65
Coconut dry		662
Walnut	15 gms.	102
Cashew	10 gms.	88
Groundnuts	100 gms.	560
Vegetables:		
Cabbage	100 gms.	27
Maithi	,,	49
Kadosh leaves	,,	28
Palak	,,	26
Greens	,,	55 to 85
Roots & Tuberi:		
Carrot	100 gms.	48
Hokes root	,,	53
Aloo	,,	97
Tapioca	,,	157
Yam	,,	79
Calocasia	,,	97
Omoris		50
Sweet potato	,,	120
Turnip	,,	29

Other Vegetables:	Qnty.	Cal.
Brinjal	100 gms.	24
Cauliflower	,,	30
Chillies green	,,	29
Garlic	,,	26
Peas	,,	93
Kela (green)	,,	64
Broad beans	,,	48
Cardamom	,,	229
Chillies dry	,,	246
Papaya green	,,	27
Pepper	,,	304
Pumpkin	,,	25
Turmeric	,,	349
Fresh fruits:		
Apple	100 gms.	56
Gooseberry	,,	53
Grapes blue	,,	53
Banana		153
Cherris	,,	70
Grapes fruits	,,	32
Jamun	,,	47
Mango	,,	50 to 80
Orange	,,	53
Pine apple	,,	46
Sapota	,,	94
Dried fruits:		
Apricots	100 gms.	306
Melon (seeds)	,,	607
Dates	,,	317
Raisen	,,	308
Salads & Soups:		
Beetroot	100 gms.	62
Carrot	,,	48
Tomato	,,	21
Cabbage	,,	27
Cucumber	,,	13
Tomato soup	,,	85
Biscuits:		
Salted	1 No.	15
Sweet	1 No.	24
Cake		103

Snacks:	Qnty.	Cal.
Chakli	100 gms.	550
Dhai Vada	,,	364
Topiaca chups	,,	570
Dal Vada	,,	200
Samosa	,,	250
Sweets:		
Badami Halva		570
Gulab Jamun	25 gms.	100
Jilebi	1 No.	412
Mysore pak	,,	357
Pedha	,,	83
Rasgulla	,,	100
Beverages:		
Apple juice	250 ml.	95
Coconut water	200 ml.	50
Coffee no sugar	10 gm. milk	25
Grape juice	200 ml.	65
Limca	1 bottle	50
Orange juice	200 ml.	95
Tomato Juice	200 ml.	45

2.4 Other components of food stuffs: Apart from the energy producing proximate principles, Vitamins and mineral salts play a vital role. A brief summary is presented below.

(i) Vitamins:

Vitamins are organic substances present in small amounts in several food stuffs. They are commonly named as A, B, C, D, etc. Based on their solubility they are divided as water or fat soluble vitamins. Vitamins A D E & K are fat soluble and vitamins of B complex and C are water-soluble.

Table 2.4 summarises the main details about the vitamins.

TABLE 2.4

ROLE OF VITAMINS IN BODY

No.	Vitamin name & structure	Function in the body	Symptoms/ diseases due to deficiency	Sources in food stuffs
1.	'A' CAROTENE in foodstuffs are converted to Vitamin A.	Keeps epithelial tissues in the body intact.	Outer layer of eye ball gets dry and wrinkled. Redness of eye and its inflammation. May lead to loss of vision.	CAROTENE Butter, Ghee, Milk, eggs, curds, liver (liver oil) leafy vegetables, corrainder leaves, drum stick leaves, radish leaves, carrots, yellow pumpkin etc. Ripe fruits like, Mangoes, papaya & tomatos. (Daily 50 gms. of common leafy vegetables will suffice)
2.	B COMPLEX			
a.	'B_1' Thiamine also called Anti Beri-beri. Anti-neuritic	Helps in proper utilisation of Carbohydrates in the body. Its absence in adequate amounts will adversely affect the full utilisation of sugar and starch.	Dry beri-beri; Loss of appetite, tingling and numbness in legs and hands. Foot drop. Wet beri-beri; Dropsy, palpitation, breathlessness & weakness of heart muscles.	Yeast. outer layers of rice, wheat unmilled cereals, pulses and nuts particularly ground nuts.
b.	'B_2' Riboflavin	Oxidation process in cells.	Soreness of tongue, eye redness, scaliness of skin, scrotal dermatitis.	Milk and milk products, eggs, liver, green leafy vegetables, wheat. millets & pulses.
c.	Niacin (Nicotinic acid) (Pantothenic acid)	Intimately connected with several metabolic processes.	Pallagra : Soreness of tongue, pigmented scaly skin and diarrhoea.	Whole cereals, pulses, nuts and meat. Milk also helps.
d.	'B_6' Pyridoxamine Pyridoxol Pyridoxine	Important in some metabolic processes.	Cracking at the angles of the lips, & certain anaemias, convulsions in children.	Vegetables, whole cereal grains, Meat, liver etc.

No.	Vitamin name & structure	Function in the body	Symptoms/ diseases due to deficiency	Sources in food stuffs
e.	Folic acid	Multiplication and maturation of cells.	Anaemia in children and pregnant women.	Fresh green vegetables, liver and pulses.
f.	B_{12}	Maturation of cells, proper functioning of CNS.,	Anaemia, degeneration of nervous system.	Milk, meat and liver.
3.	'C' ASCORBIC ACID	Intense reducing action and hence rapidly gets oxidised in air. Useful for proper calcification of bones and teeth & proper absorption of iron by body.	Scurvy : Bleeding gums, bleeding spots under the skin, Painful joints.	Fresh fruits, Vegetables, particularly green leafy varieties. Sprouting brings Vitamin C in pulses. Germination synthesises and hence sprouted bengal gram, green gram provides adequate C. Amla fruit, fresh orange.
4.	'D' CHOLE CALCIFEROL	Calcium absorption from intestine and deposition of lime salt in the bone.	Rickets and osteomalacia: Bone softening leading to deformities. Excess Vitamin D can cause nausea, vomiting, irritability, constipation, bone softening & kidney damage.	Liver, liver oil, egg yolk, milk, milk fats. Exposure of skin to sunlight synthesizes Vit. D.
5.	'E'	Antioxidant property	Antisterility Vitamin	Oils of germs of cereals and vegetable oils.
6.	'K'	Helps in proper clotting of blood.	Profuse bleeding. Frequently seen in new born babies.	Green leafy vegetables.

TABLE 2.5

EFFECT OF MINERAL SALTS IN THE BODY

No.	Name	Function in the body	Sources in Food
1.	Calcium	a. building material for strong bones and teeth. b. helps in proper contraction of muscles of heart. c. helps in blood clot.	Milk, cheese, etc. green leafy vegetables, topioca, Ragi, very less in rice.
2.	Phosphorous	a. utilisation of Ca is done as a deposit of calcium phosphate. b. helps in assimilation of fats and carbohydrates.	Cereals, pulses, nuts and oilseeds.
3.	Iron	a. chief content in haemogloblin tho red pigment of blood. b. prevents certain forms of anaemia.	Green leafy vegetables, millets, bajra & ragi.
4.	Sodium and Potassium	present in fluids outside and within the cells respectively. Essential for maintaining salt and water balance in the body.	Common salt provides the necessary Sodium. Potassium is found in most vegetables.
5.	Magnesium	a. also forms part of bone, along with calcium magnesium. b. biological functions in body.	Green pigment, the chlorophyll in vegetable goods is rich in magnesium.
6.	Copper	Helps in utilisation of iron in the body.	
7.	Zinc	Helps in preventing impaired growth and testicular degeneration.	
8.	Iodine	Goitre (Swelling of thyroid gland) is prevented by sufficient iodine intake.	Drinking water is the main source.
9.	Flourine	Flourosis due to excessive flourine may affect the bones and teeth. Small required amounts help to prevent dental caries.	Drinking water is the main source.

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APPROXIMATE NUTRITIVE VALUE OF SOME OF THE FRUITS

Sr. No.	Name of the fruit	Calories	Carbohydrates (gms.)	Fat (gms.)	Protein (gms.)	Iron (mgs.)	Minerals (mgms.)	Calcium (mgms.)
1.	Amla	58	13.7	0.1	0.5	1.2	0.5	50
2.	Apple	59	13.4	0.5	0.2	1.0	0.3	10
3.	Apricot, dried	53	11.6	0.3	1.0	2.2	0.7	20
4.	Banana	116	27.2	0.3	1.2	0.9	0.8	17
5.	Cherries, Red	64	13.8	0.5	1.1	1.3	0.8	24
6.	Dates, dried	317	75.8	0.4	2.5	7.3	2.1	120
7.	Grapes, blue variety	58	13.1	0.4	0.6	0.5	0.9	20
8.	Grapes, Pale green	71	16.5	0.3	0.5	0.5	0.6	20
9.	Guava, country	51	11.2	0.3	0.9	1.4	0.7	10
10.	Guava, hill	38	9.0	0.2	0.1	1.2	0.6	50
11.	H. Jack fruit	88	10.8	0.1	1.9	0.5	0.9	20
12.	Musambi	43	9.8	0.3	0.8	0.7	0.7	40
13.	Mango, ripe	74	16.9	0.4	0.6	1.3	0.4	14
14.	Melon, water	16	3.3	0.2	0.2	1.4	0.3	11
15.	Orange	48	10.9	0.2	0.7	0.32	0.3	26
16.	Papapa	32	7.2	0.1	0.6	0.5	0.5	17
17.	Pears	52	11.9	0.2	0.6	0.5	0.3	8
18.	Pineapple	46	10.8	0.1	0.4	1.2	0.4	20
19.	Plum	52	11.1	0.5	0.7	0.6	0.4	10
20.	Pomegranate	62	14.5	0.1	1.6	0.3	0.7	10
21.	Sapota	98	21.4	1.1	0.7	2.0	0.5	28

TABLE 3.1 APPROXIMATE NUTRITIVE VALUES OF THE COMMON FOOD PREPARATIONS

Sr. No.	Food Stuff		Present work Quantity	Cal.	From Table 2.3	Ref 10b Swaminathan Quantity	Cal.	Ref 10c Home Science College Quantity	Cal.
1.	Adai (Hot)	1 No.	100 gms.	200	—	96 gms.	195		—
2.	Akkirotti	1 No.	33 gms.	318	—		—		—
3.	Bisibele bath	1 serving (1 cup)	130 gms.	260	—		—		—
4.	Custard	1 cup		106	—		—		106.3
5.	Dosa	1 No.	52 gms.	110	—	50 gms.	108	50 gms.	108
6.	Idli	1 No.	—		100 (medium size)	gms.	65	68 gms.	65
7.	Kesari bath	1 serving	75 gms. ½ cup	235	—	90 gms.	282	190 gms.	564
8.	Masala Dosa	1 No.	100 gms,	220	—	100 gms.	212	100 gms.	212
9.	Parathas (plain)	1 No.	55 gms.	300	275	56 gms.	394	56 gms.	394
10.	Parathas stuffed (potato)	1 No.	85 gms.	324	—		—	80 gms.	307
11.	Pongal (kichdi)	1 serving (1 cup)	130 gms.	190	—	140 gms.	200	148 gms.	200
12.	Puri	1 No.	20 gms.	92	—	16 gms.	68	16 gms.	68
13.	Pulka	1 No.	31 gms.	105	119	28.5 gms.	96.5	28.5 gms.	96.5
14.	Ragiball	1 No.	—		—	336 gms.	446	336 gms.	446
15.	Ragi rotti	1 No.	50 gms.	125	—	94 gms.	230	61.6 gms.	153.3
16.	Rava Dosa	1 No,	22 gms.	140	—		—	38 gms.	240
17.	Rava Idli	1 No.	24 gms.	150	—	16 gms.	68	16 gms.	68
18.	Rava Uppuma	1 serving (1 cup)	—	60	56		—		—
19.	Wheat Uppuma	1 serving		—	—	138 gms.	163	128 gms.	163
Bakery Products :									
1.	Biscuits (salted)	1 No.		—	15		—		56
2.	Bread	1 Slice		—	60		—		—
3.	Bun	1 No.		—	280		—	31 gms.	100
4.	Butter	1 teaspoon		—	—		—		3
5.	Jam	1 „		—	20		—	28 gms.	58

Table 3.1 Continued.....

Sr. No.	Food Stuff	Present work Quantity	Cal.	From Table 2.3		Ref 10 b Swaminathan Quantity	Cal.	Ref 10 c Home Science College Quantity	Cal.
1.	Egg	1	—	—			—		173
2.	Omlette	1	—	—			—		77
Snacks :									
1.	Bajji	1 No.	5 gms.	28	—		—		22.6
2.	Chakli	1 No.		—	550		—		136
3.	Dahi Vada	1 No.	16 gms.	160	—		—		—
4.	Papad	1 No.		25	25		—		31
5.	Potato Bonda	1 No.	30 gms.	70	—		—	28 gms.	61
6.	Vada (Uddin Vada)	1 No.	16 gms.	154	200		—		—
Milk Products :									
1.	Butter milk	1 cup		—	15		36		36
2.	Coffee	1 cup		—	25		104		78
3.	Curd	1 cup		60	60		—		60
4.	Milk (Cow's)	1 cup		—	100		130		218
5.	Tea	1 cup	(no sugar)	20	—		—		—
1.	Amarnath curry	1 serving ($\frac{1}{4}$ cup)	40 gms.	72	—	28 gms.	47	112 gms.	188
2.	Cabbage curry	1 serving ($\frac{3}{4}$ cup)		34	—		—		—
3.	Kosambari	1 cup		160	—		—		—
4.	Majjige Huli	1 cup		66	—		—		—
5.	Raitha	1 cup		60	—		—		—
6.	Rasam (Tomato + Redgram dhal)	1 cup		25	12		23.4		23.4
7.	Rice	1 serving	130 gms.	153	70	60 gms.	504 gms.	595	168 gms. 195
8.	Redgram dhal	1 cup	100 gms.	106	92	100 gms,	182 gms.	220	180 gms. 220

9.	Sagu or Vegetable curry	1 cup	160	—	—	-
10.	Salad (Tomato, cucumber, onion)	1 Helping	15	—	—	—
11.	Sambar	1 cup	140	—	97	97
12.	Vegetable koottu (veg.+dhall)	1 cup	149	—	—	—
Chutney						
1.	Coconut chutney	1 teb. spoon	76	—	—	73
2.	Coriander leaf chutney	1 „	20	—	—	—
3.	Mint chutney	1 „	35	—	—	35
4.	Onion gojju	1 „	6	—	—	—
5.	Tomato chutney	1 „	24	—	—	26

Sr. No.	Food Stuff	Quantity	Nutritive value Table 2.3
Sweets:			
1.	Badami Halwa	100 gms.	570
2.	Gulab Jamun	25 gms.	100
3.	Jelebi	100 gms.	412
4.	Laddu	100 gms.	430
5.	Mysore Pak	100 gms.	357
6.	Pedha	50 gms.	83
7.	Rasagulla	100 gms.	100
8.	Sohan Pappadi	100 gms.	400

Sr. No.	Food Stuff	Quantity	Wt. per serving gms.	Calories K. Ca.	Protein gms.	Fat gms.	Carbohydates
Milk Dreparations :							
1.	Bengalgram / dhal payasam	1 cup	140	221	7.7	5.1	35.9
2.	Buffalo Milk	1 cup	200	216	8.4	16.0	9.2
3.	Butter Milk (Buffalo milk)	1 cup	200	66	2.4	5.0	2.8
4.	Rice Payasam	1 cup	154	178	3.2	4.2	31.7
5.	Rice Porridge	1 cup	280	263	7.6	6.2	44.
6.	Ragi Porridge	1 cup	280	263	6.9	6.3	44.7
7.	Wheat Payasam	1 cup	154	178	3.2	4.2	31.5
8.	Wheat Porridge	1 cup	193	317	8.7	8.0	52.7
Fruit Products :							
1.	Orange juice	1 glass	200	96	1.4	0.2	22.6
2.	Mango juice	1 glass	200	120	0.8	0.2	29.2
3.	Raisins	2 tbs.	25	79	0.5	0.05	19.0
4.	Raisins (Dried)	—	100	315	2.0	0.2	76.2
5.	Tomato juice	1 glass	200	38	1.0	0.2	8.6

SAMPLE MENU OF A VEGETARIAN DIET FOR DIABETES MELLITUS

TABLE 3.2 (A)

Time	Food stuff	Quantity	CHO	Proteins	Fat	N.V. (KCal)
6.00 am	Coffee	1 cup				25
8.00 am	Idli	2 Nos.	43.52	7.36	.44	200
Breakfast	Chutney (coconut)	2 tbs.	7.00	2.4	6.0	52
12.30	Rice ($1\frac{1}{4}$ cup)	1 serving	45.00	3.96	.3	200
Noon	Sambar	2 cups	21.8	8.474	.604	280
Lunch	Rasam	2 cups	5.0	1.0	.6	39
	Cabbage curry	2 cups	11.5	4.5	.25	68
	Butter milk	2 cups	1.0	1.6	2.0	30
5.00 pm	Milk	1 cup	4.4	3.2	4.1	100
	Biscuits (salted)	2 Nos.				15
8.00 pm	Chappati	2 Nos.	30.8	7.3	5.6	210
Dinner	Dhal + Veg.	2 cups	19.12	12.8	4	212
	Bittergourd	2 cups	8.4	3.2	1.6	62.5
	Salad					15
	Buttermilk	1 cup	.5	.8	1.1	15
Bedtime	Milk	1 cup	4.4	3.2	4.1	100
			202.4	59.794	30.694	1623.5
			56.13%	76.5%	17%	

TABLE (3.2) B

6.00 am	Coffee	1 cup				25
	Buttermilk	1 cup	0.5	0.8	1.1	15
9.30 am	Rice	2 cups	67.5	5.94	0.45	300
Lunch	Sambar	1 cup	10.9	4.237	0.302	140
	Rasam (Tomato)	2 cups	9.9	2.0	.8	46.8
	Brinjal curry	2 cups	9.8	2.8	21.4	244
	Curds	1 cup	3.0	3.1	4.0	60
	Appalam	1 No.	1.6	.6	2.5	25
1.30 pm	Coffee	1 cup				25
3.00 pm	Potato Bonda	2 Nos.	19.2	2.2	4.08	122
	Coconut chutney	1 tbs.	3.5	1.2	6.0	78
	Butter milk	1 cup	.5	.8	1.1	15
5.30 pm	Horlicks	1 cup	4.4	3.2	4.1	106.8
7.30 pm	Chappati (pulkha)	3 Nos.	46.2	7.5	8.25	315
	Dhal with veg.	2 cups	22.0	7.46	5.73	212
	Salads					15
	Butter milk	2 cups	1.0	1.6	2.2	15
10.00 pm	Milk	1 cup	4.4	3.2	4.1	100
			204 4	46.637	66.112	1766
			52%	11.8%	33.69%	

TABLE 3.2 (C)

Time	Food stuff	Quantity	CHO	Proteins	Fat	N.V. (KCal)
6.00 am	Coffee	1 cup				
8.00 am	Butter milk	1 cup	0.5	0.8	1.1	25
10.00 am	Rice	2 cups	67.5	5.94	0.45	15
	Dhal	¼ cup	7.81	17.1	5.3	300
	Majjige Huli	2 cups	1.0	1.6	2.2	23
	Bitter gourd	2 cups	8.4	3.2	1.6	132
	Rasam	2 cups	9.9	2.0	.8	62.5
	Curds	1 cup	3.0	3.1	4.0	46.8
	Appalam	1 No.	1.6	.6	2.5	60
1.30 pm	Coffee	1 cup				25
3.00 pm	Vada	2 Nos.	29.8	12.0	.7	25
	Sambar	½ cup	5.45	2.118	0.151	300
	Fruit juice (Moosambi)	1 cup	28.4	0.8	0.3	70
	Coffee	½ cup				89
5.30 pm	Horlicks	1 cup	4.4	3.2	4.1	12
7.30 pm	Rice	1 serving	45	3.96	0.3	106.8
	Sambar	1 cup	10.9	4.237	0.302	200
	Rasam (Tomato)	1 cup	4.95	1.0	.4	140
	French beans	2 cups	9	3.4	0.2	23.4
	Butter milk	2 cups	1.0	1.6	2.2	52
10.00 pm	Milk	1 cup	4.4	3.2	4.1	30
						100
			239.01	63.585	25.546	1837.5
			58.5%	14.77%	11.8%	

TABLE 3.2 (D)

6.00 am	Coffee	1 cup				
8.00 am	Bread	3 slices	37.8	6.6	2.9	25
	Butter	1 tbs.	.1	.1	11.3	180
	Egg Omlette	1 No.	5	5.8	5.7	3
	Butter milk	1 cub	.5	.8	1.1	77
10.00 am	Horlicks	1 cup	4.4	3.2	4.1	15
12.30 Noon	Rice	1 serving	45	3.96	0.3	106.8
	Tomato soup	1 cup	8.9	3.4	1.4	200
	Fish curry	1 serving	1.4	17.5	16.2	62
	Salad					220
	Cauliflower & peas	2 cups	11.0	5.7	.8	15
	Greens	1 cup	6.1	4.0	0.5	74
	Curds	1 cup	3.0	3.1	4.0	72
4.30 pm	Coffee	1 cup				60
	Bajji	1 plate (6 Nos.)	11.3	2.3	8.3	25
	Mint chutney	1 tbs.	7.0	.9		133
8.30 pm	Chappati	2 Nos.	30.8	7.3	5.6	33
	Meat fry	1 serving	4.5	21.8	26.0	210
	Salad					339
	Knol-Kol curry	1 cup	3.8	1.1	0.2	15
	Butter milk	1 cup	0.5	0 8	1.1	21
						15
			180.605	88.36	89.5	1900.8
			42.75%	20.92%	42.3%	

TABLE 3.2 (E)

Time	Food stuff	Quantity	CHO	Proteins	Fat	N.V. (KCal)
6.30 am	Coffee	1 cup				25
8.00 am	Pongal	1 serving	30.5	5.5	6.6	190
	Onion gojju					24
	Milk	1 cup	4.4	3.2	4.1	100
12.00 Noon	Cabbage	1 cup	6.1	1.8	14.3	42
	Vegetable sandwiches	6 slices	75.6	13.4	4.8	360
	Kothmari Chutney	4 tbs.	2.3	3.3	0.1	80
	Custard with fruits	1 cup	16.45	5.0	1.2	200.8
2.30 pm	Butter milk	1 cup	.5	.8	1.1	12
5.00 pm	Pakoda	1 plate (4 Nos.)	18.0	8.3	8.0	176
	Coffee	1 cup				25
7.30 pm	Chappati	2 Nos.	30.8	7.5	5.60	210
	Dhal with Vegetables	2 cups	22.0	7 46	5.73	212
	Salad					15
	Curds	1 cup	3.0	3 1	4.0	60
10.00 pm	Milk	1 cup	4.4	3.2	4.1	100
			214 05	58.87	57.50	1834.8
			52.50%	14.4%	28.2%	

TABLE 3.2 (F)

6.00 am	Coffee	1 cup				25
8.00 am	Dosa	3 Nos.	28.2	4.1	9.7	330
	Coconut Chutney	2 tbs.	7.0	2.4	12.0	146
	Butter milk	1 cup	0.5	0.8	1.1	15
10.30 am	Tomato juice	1 glass	8.6	1.0	0.2	38
12.30 Noon	Bisibelebath (175 gms.)	1 serving ($1\frac{1}{4}$ cup)	60.8	10.8	6.0	350
	Curds rice	1 serving (1 cup)	8.3	6.0	7.0	100
	Potato chips	1 plate (25 gms.)	7.4	.6	8.4	107
4.30 pm	Coffee	1 cup				25
5.00 pm	Vegetable cutlet	2 Nos.	2.2	2.4	17.2	252
	Tomato chutney	1 tbs.	2.3	.5	.95	19.5
7.30 pm	Chappathi	2 Nos.	30.8	7.3	5.6	210
	Sagu or Veg. curry	1 cup	24.7			160
	Salad					15
	Raitha	1 cup	21.4			60
	Butter milk					15
10.00 pm	Milk	1 cup				100
			230.3	32.39	66.17	1778.5
			56.16%	7.76%	31.7%	

TABLE 3.2 (G)

Time	Food stuff	Quantity	CHO	Proteins	Fat	N.V. (KCal)
6.00 am	Coffee	1 cup				25
8.00 am	Puri	3 Nos.	19.5	3.3	12.6	276
	Sagu	1 cup	24.7			160
	Butter milk	1 cup	.5	.8	1.1	15
12.30 Noon	Rice	1 serving	45	3 96	0 3	200
	Sambar	1 cup	10.9	4.237	0.302	140
	Rasam	1 cup	4.95	1.9	.4	23.4
	Bitter gourd curry	2 cups	8.4	3,2	1.6	62.5
	Appalam	2 Nos.	3.2	1.2	5.0	50
	Curds	1 cup	3.0	3.1	4.0	60
5.00 pm	Muruku (Chakli)	1 No.	7.46	2.86	10.53	136
	Coffee	1 cup				25
7.30 pm	Adai	2 Nos.	63.6	13 2	8.8	406
	Mint chutney	2 tbs.	14.0	1.8		66
	Butter milk	2 cups	1.0	1.6	2.2	30
10.00 pm	Milk	1 cup	4.4	3.2	4.1	100
			210.61	38.433	47.386	1774.9
			53.39%	9.7%	24%	

2.5 Present studies & recommendations on diet schedule : We have presented the nutritive value of Indian foods and their energy values in common food stuffs in Tables 2.1 and 2.2. To calculate the actual energy values in the common diets of our patients, it was felt necessary to know the values of various cooked items of food which are commonly used by the patients. Based on such information, a diet schedule could be recommended. The present work was to fulfil this need for obtaining information about an easily available measure, and an easy to follow diet chart.

Commonly used cooked items of food were prepared, weighed and their nutritive values calculated. Atleast 5 repeated trials were made and results obtained. The data are presented in Tables 3.1. These results are compared with other data available elsewhere.

The balanced diet for diabetics shold contain approximately 55% carbohydrates 15% proteins and 30% fats apart from other essential ingredients. The recommended total quantities and kilocalories per day for diabeties are given below :

I. Carbohydratcs – 100 (min) to 240-260 (max) gms./day
Fats – 50–150 gms./daily.

II a. an obese middle aged or elderly patient with mild diabetes — 1000–1600 Kcal/day

b. an elderly diabetic but not overweight — 1400–1800 Kcal/day

c. a young active diabetic — 1800–2000 Kcal/day

Based on the above considerations diet schedules are worked out and the recommended values are presented in Tables.

3. SHORT TERM STUDIES :

3.1 Patients & Parameters :

TABLE : 4.1

DETAILS ABOUT PATIENTS

	Short Term Studies		Long Term Studies	
	Adult	Juvenile	Adult	Juvenile
Number of Patients	73	9	49	3
Males	58	7	36	2
Females	15	2	13	1
Age range	31 to 70	19 to 51	28	72
Duration of follow up	4 weeks		6 months to $4\frac{1}{2}$ years	
Average Duration of Diabetes	6	10	6.3 years	

A. Patients : Table 4.1. 82 patients entered the study designed to assess the effect of yoga practices on their diabetic state. Of these 73 were of the adult onset type and 9 were Juvenile type.

Those patients whose diabetes had started after the age of 25 years were considered to be adult onset type and those whose diabetes started below the age of 25 years were called Juvenile onset type. All the Juvenile type were Insulin dependent.

There were 65 males of which 58 were of Adult type and 7 belonged to Juvenile group. Of the 17 females 15 were adult onset type.

Age range : Adult onset type 31 to 70 years and Juvenile type 19 to 51. Mean duration of diabetes before they entered this study was 6.1 ± 5.5 for adult onset-type and that for Juvenile type was 9.9 ± 6.9 years. (Table 4.1)

After their initial assessments they underwent the integrated approach of Yoga training programme. The data on all the parameters were obtained both before and after the training programme of 2 to 4 weeks in different batches spread out during the years 1980 to 83. Patients with any other associated major diseases like I.H.D., H.B.P. etc. were not included in this study.

B. Parameters : (1) The symptoms were scored + or − before and after the 4 weeks of training. While recording the initial data history of the symptoms over the previous one month was noted, so that it could be compared with the following one month of yoga training.

The symptoms noted were (1) excess thirst, (2) excess hunger, (3) general weakness, (4) average frequency of urination in a day and (5) other symptoms scored one each for any other minor complaints that were present.

(6) Medication per week : The average number of oral antidiabetic tablets consumed were recorded in terms of number of tablets per week.

In case of Juvenile diabetics the dose of the insulin in units/day was recorded, which included the sum of both types of insulin, if the patient was taking a combination of long acting and short acting insulin.

(7) Weight (8) Pulse rate (9) Respiratory rate and (10) & (11) Blood pressure were recorded before and after yoga course.

(12) Urine Sugar : Presence of reducing agent detected by using Benedict's solution was tested in the urine sample collected at the same time as the sample of blood.

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(13) 2 hr. PPBS : The patients had taken their medicines as usual and the blood was drawn exactly 2 hours after food for the estimation of glucose values. Ortho toludeine method was used for the blood glucose estimation.

(14) Blood cholesterol : The cholesterol level in the blood was also estimated in 23 patients.

(15) Diet : The details about the diet which the persons consumed during the study period was recorded by asking them to fill up the daily diet sheet as soon as they reached the centre for their daily yoga training programme. They all had an initial discussion about their diet 1–2 weeks prior to the commencement of the programme, so that they could stabilise their diet well before the beginning of the yoga training. Even at the time of initial interview the general observation was that most of these persons were well informed about the diet for a diabetic through the diabetic association of Bangalore and we did not have to make many changes in their schedule. The calorie values of the daily diet sheet were calculated.

3.2 Results : The difference between initial and the final data on all the parameters were taken and Student's 't' test applied to assess the statistical significance of these differences-

Table 4.2 shows the mean and standard deviation of the initial and final values and the 't' values, for the whole group.

Table 4.2–a : the results for the adult onset type and

Table 4.2–b : the results for the juvenile onset type.

Adult Onset Type :

Looking at the results it is observed that the results show significant improvement in all the parameters in adult onset type of diabetics without a significant change in the calorie content of their diet, within these 4 weeks of yoga practices.

All the symptoms show significant reduction. Medication per week shows reduction in tablets from 7 ± 12 to 6 ± 11 which is statistically highly significant with a 't' value of 3.415. Weight, PR, RR and BP show significant reduction. Urine sugar has reduced from 1.2 ± 0.7 to $0.8 \pm 0.7\%$ with a significance of $P < 0.005$. 2 Hr. PPBS has reduced from 180 ± 59 to 163 ± 41 which is highly significant. Blood cholesterol results available for 23 patients also had reduced form 212.6 ± 20 to 193.9 ± 11.7 with a significance level of ($t = 4.68$) $P < 0.005$.

The fall in the calories in diet from 1745 to 1618 is not significant.

Juvenile onset type : In 9 persons with juvenile onset type of diabetes, it is observed that there is no significant improvement in any of the important parameters observed except the frequency of urination and blood pressure.

Classification and Discussion :

3.3 Weight : Table 4.3 a. All patients were classified into 3 grades ; weight steady cases, weight loss cases and weight gain cases.

(i) In the 28 weight steady cases there was significant reduction in mean PPBS from 198.3 to 171 with $P < 0.005$. The fall in their medication per week from 11.7 to 9.9 was also highly significant.

Fig.4.1-DIET GRAPH-Diabetes Mellitus Camps A&B

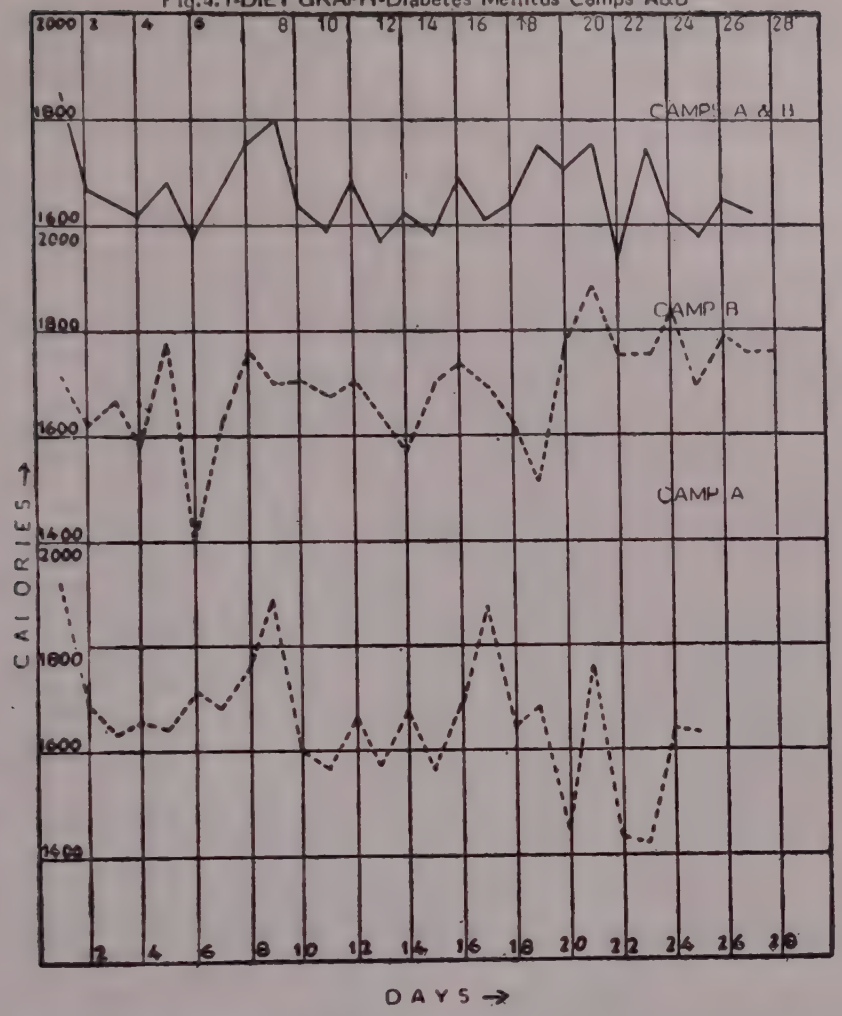


Table 4.2 DM Short Term Study (Whole group) Adult & Juvenile Type

	Parameters	n	$\bar{x}$b	SD b	$\bar{x}$a	SD a	t
		1	2	3	4	5	6
1.	Excessive Thirst	33	0.15	0.36	0.03	0.17	2.10*
2.	Excessive Hunger	32	0.25	0.43	0.09	0.29	2.67*
3.	General weakness	30	0.23	0.42	0.10	0.30	2.26*
4.	Other Symptoms	30	1.13	0.85	0.48	0.62	3.61**
5.	Frequency of Urination	26	7.25	2.35	5.79	1.97	2.87**
6.	Medication	74	14.26	20.39	11.04	17.62	3.18**
7.	Weight	81	61.67	9.26	61.31	8.85	2.93**
8.	PR	82	79.61	9.41	76.69	10.20	3.18**
9.	RR	81	22.68	3.58	21.51	3.12	4.08**
10.	BP (Systolic)	81	128.67	17.57	123.63	18.08	3.57**
11.	BP (Diastolic)	81	88.56	14.15	85.26	13.33	2.90**
12.	Urine Sugar	32	1.13	0.73	0.86	0.77	2.16*
13.	2 Hrs. PPBS	78	181.30	55.93	163.27	40.54	4.08**
14.	Blood Cholesterol	26	211.77	20.39	198.48	11.56	4.95**
15.	Diet	33	1738.24	526.42	1623.06	468.67	0.04 NS

1 — Number of patients.
2 and 4 — Mean value before and after yoga correspondingly.
3 and 5 — Standard deviation for the corresponding means.
6 — 't' Value 1.86 = P of 0.01 indicated as *
't' Value > 2.6 = P < 0.000 indicated as **

Significant improvement on all parameters indicative of diabetic state.
NS: No significant change in the calorie content over the period of study.

D.M. SHORT TERM STUDY

TABLE : 4.2 (a) ADULT ON-SET

Sl No		n	$\bar{x}b$	$\bar{x}a$	cb	ca	t
01.	Excess Thirst	28	0.14	0.04	0.35	0.185	1.80*
0.2	Excess Hunger	27	0.30	0.11	0.46	0.31	2.43**
03.	Other Symptoms	42	1.16	0.56	0.69	0.62	4.22**
04.	General Weakness	27	0.11	0.19	0.31	0.39	0.81 NS
05.	Frequency of Urination	20	7.55	6.00	2,71	2.92	2.16*
06.	Medication	72	7.18	6.41	12.19	11.44	3.42**
07.	Weight	72	62.49	61.92	9.18	8.80	4.11
08.	P.R	72	78.12	76.41	12.42	9.86	3.23**
09	R.R.	72	23.03	21.61	3.28	3.06	4.61**
10	B.P(Systolic)	72	129.77	124.09	16.64	17.96	3.61**
11.	B.P.(Diastolic)	72	90.11	85.96	12.79	15.55	3.40**
12.	Urine Sugar	27	1.21	0.83	0.72	0.73	4.13**
13.	2 Hrs. PPBS	71	180. 24	163.70	58.97	41.02	4.41**
14	Blood Cholestrol	23	212. 57	198.87	20.04	11.75	4.68**
15	Diet	28	1745.00	1618.64	544.06	481.12	0.36NS

TABLE: 4.2 (b) JUVENILE ON-SET

Sl No.		n	$\bar{x}b$	$\bar{x}a$	cb	ca	t
1.	Excess Thirst	5	0.20	0	0.40	0	1 NS
2.	Excess Hunger	5	0.20	0	0.40	0	1 NS
3.	Symptoms	5	0.80	0.6	0.75	0.41	1 NS
4.	General Weakness	5	0.60	0	0.49	0	1 NS
5.	Frequency of Urination	4	7.50	6.25	2.69	1.30	2.19*
6.	Medication	5	51.60	46.4	30.10	30.39	1 NS
7.	Weight	9	55.11	55.39	6.98	7.26	514 NS
8.	P.R	9	82.67	81.11	11.74	12.22	514 NS
9.	R.R	9	19.89	20.0	4.53	1.89	09 NS
10.	B.P(Systolic)	9	118.61	117.78	23.01	17.50	3 *
11.	B.P.(Diastolic)	9	70.67	70.67	8.84	9.61	3 **
12.	Urine Sugar	5	0.50	1.00	0.77	0.89	688 NS
13.	2 Hrs. PPBS	8	170.13	162.75	54.06	32.40	343 NS
14.	Blood Cholesterol	4	206.75	196.25	19.10	10.16	1.59NS
15.	Diet	5	1700.40	1651.20	412.12	388.81	547 NS

(ii) In 34 cases with weight loss the mean PPBS fell significantly from 168 to 151 with $P < 0.005$ and the fall in medication was from 9.5 to 9.05 with a significance level of $P < 0.005$.

(iii) In 14 cases with gain in weight the reduction in PPBS from 188 to 178 was not significant. Their medication per week showed significant reduction from 29 to 22, with a significance level of $P < 0.005$.

The initial medication was very much higher in weight gain cases compared to the weight steady and loss cases. In all the 3 groups there has been significant fall in the dose of their tablets.

The improvement observed as significant reduction in PPBS and medication in 31 weight steady and the reduction in PPBS and medication in 34 weight loss cases are similar to our earlier observation in short term follow up studies (Report 5).

Weight Vs Adult/Juvenile Type : The effect of 4 weeks of yoga practices on the 3 weight categories of adult and juvenile onset type diabetics are shown in Tables 4.3 (a) and 4.3 (b).

(a) In the adult onset type the pattern of reduction in PPBS and medication are similar to the whole group in the 3 weight categories. The fall in PPBS is highly significant in weight gain group. Similarly the reduction in medication per week has reached highly significant levels in weight steady cases as in the whole group, but not significant in weight loss and weight gain cases.

Here we see the pattern of the adult onset type is reflected in the whole group.

(b) Table 4.3 (b). In juvenile onset type it is difficult to assess the results as the number in each group is less then 9 and 't' test have not been applied to these results.

Looking at the mean values for PPBS amongst 2 weight steady cases the PPBS has increased from 157.5 to 185, and from 153.5 to 156 in weight gain cases.

Mr. C. N. aged 22 years in the weight loss group (60 kgs. to 59 kgs.) did show a reduction of PPBS from 272 mg. to 198 mg. without significant change in the calorie content of his food (1680 before and 1644 after) or his medication which remained the same (20 units Lente Insulin/day) before and after 4 weeks of yoga.

From these results we can see that it is the adult onset type of diabetic who starts showing improvement as early as 4 weeks of regular yoga practices. In case of juvenile diabetics the improvement is not satisfactory in this short term study.

The weight wise classification tells us that it is not only the reduction in weight during the study period that has been responsible for the improvement as exactly similar reduction in PPBS and medication are seen in the weight steady group too. This supports our earlier observations. We feel that yoga is not a simple physical exercise which controls diabetes through weight reduction but acts at a deeper level of physiology to get the diabetes under control apart from altering the body weight.

In weight gain cases of adult onset type no significant improvement in PPBS although they have reduced their medica tion significantly. As the number in this group is small we cannot make any major conclusions from these results.

TABLE- 4.3(a)

D.M. SHORT TERM STUDY (WHOLE GROUP)(JUVENILE + ADULT)

No			n	$\bar{X}b$	b	$\bar{X}a$	a	t	P
1.	Weight Steady	Weight	31	58.13	7.12	58.13	7.12		
	Cases	PPBS	28	198.29	57.09	171.04	41.26	3.24	S
		Medica-tion	27	11.72	12.87	9.87	13.90	2.17	S
2.	Weight loss	Weight	36	64.93	10.08	63.29	9.71	8.99	S
	Cases	PPBS	34	167.82	46.98	151.44	34.61	3.69	S
		Medica-tion	34	9.54	16.00	9.04	16.58	1.64	NS
3.	Weight Gain	Weight	14	61.14	8.06	62.61	8.39	-6,68	S
	Cases	PPBS	14	188.14	67.20	175.86	47.56	0.73	NS
		Medica-tion	13	209.38	3.47	22.08	26.47	2.08	S

TABLE 4.3 (b)

D.M. SHORT TERM STUDY ADULT ONSET TYPE

No.			n	Xb	b	Xa	a	t	P
1.	Weight Steady Cases	Weight	28	53.5	7.32	53.5	7.32	-	-
		PPBS	26	201.42	57.13	169.96	42.06	4.05	
		Medication	26	9.87	3.39	7.56	7.32	3.08	S
2.	Weight Loss Cases	Weight	34	65.43	14.16	60.75	9.76	8.76	S
		PPBS	32	164.81	44.66	151.28	33.94	3.23	S
		Medication	33	11.77	20.38	8.11	15.91	1.61	NS
3.	Weight Gain Cases	Weight	10	62.7q	7.15	64.3	-7.24	-5.58	
		PPBS	10	192.0	8.77	183.8	52.63	0.84	
		Medication	10	22.4	23.73	14.5	18.05	1.80	NS
		D.M. SHORT TERM STUDY - JUVENILE TYPE							
1.	Weight Steady Cases	Weight	3	51.33	3.40	51.33	3.99		
		PPBS	2	15.75	33.5	18.0	25		
		Medication	1	40	50	50	-	-	-
2.	Weight Loss Cases	Weight	2	56.5	3.5	55.5	3.5		
		PPBS	2	21.60	56	154.0	44.		
		Medication	1	20.		20			
3.	Weight Gains Cases	Weight	4	57.25	3.86	58.38	9.09	-4.70	
		PPBS	4	153.5	56.55	156.0	22.09	-0.09	-
		Medication	3	52.67	37.96	57.33	33.48	1.00	

3.4 Diet: Another question that remains to be answered is – Has this improvement occured because of marked changes in their diet pattern after the initial interview and counselling with the doctor and better medical supervision? It is difficult to eliminate this factor without a strict objective observation of their diet over a prolonged control period before the administration of yoga.

As mentioned earlier we recorded a detailed history of the existing diet pattern of the person at the time of initial interview before advising the person about the right diet to be taken or suggesting any changes in their diet. This initial diet compared with the daily diet sheets and the final diet are analysed.

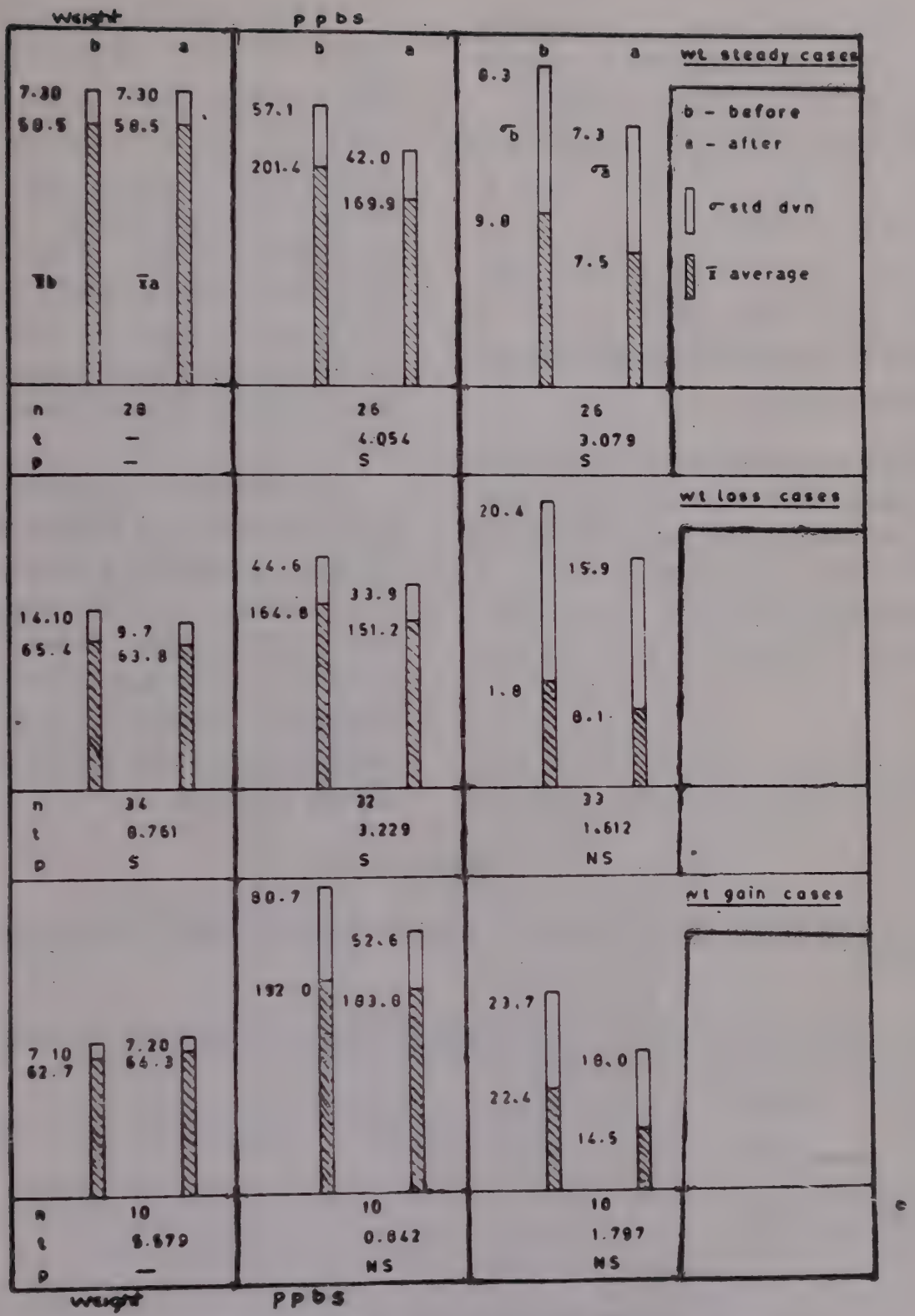
Looking at the results we observed no significant change in the diet as seen by the non significant 't' values for the differences in the mean calorie content before and after the (Table 4.4). training programme.

Table: 4.4 CALORIE VALUES

Sl. No.	Before	After	Difference	Sl. No.	Before	After	Difference
01.	1813	1306	507	16.	2108	2439	-331
02.	1949	2068	-119	17.	2287	1670	617
03.	1749	1338	411	18.	2179	1910	269
04.	1742	1888	-146	19.	1779	2546	-767
05.	1035	1296	-261	20.	1778	1568	210
06.	1295	1663	-368	21.	870	1215	-345
07.	1523	1162	361	22.	1894	1685	209
08.	1113	978	35	23.	1463	2660	-1197
09.	2153	2434	-281	24.	1765	1221	544
10.	2467	1958	509	25.	1297	1045	252
11.	2947	2709	38	26.	1703	1823	-120
12.	1851	1179	672	27.	2124	1473	651
13.	1636	1702	-66	28.	2034	1334	700
14.	2026	2009	17	29.	1621	1547	74
15.	1711	2212	-501				

Table: Analysis of diet data (calories)

Parameters	Before	After
n	29	29
Mean	1790.06	1725.44
Std. deviation	427.79	492.30
't'	0.639	
'p'	n.s.	



DM Short Term Study (Whole group) Adults & Juvenile

Table : 4.5 Diet Studies in relation to Weight

		n	x̄b	b	xa	a	't'
Weight Gain Cases	Diet	14	1893.21	591.60	1734.00	473.15	0.74 NS
Weight Loss Cases	Diet	12	1562.17	434.65	1412.50	438.25	0.89 NS
Weight Steady Cases	Diet	11	1719.45	452.23	1722.09	400.22	0.20 NS

Table 4.5 shows the diet analysis in relation to weight changes. It is observed that there is no significant change in their diet during the yoga period considering the 't' values for the differences of the mean calorie content before and after yoga, in all the 3 weight categories.

In weight steady as well as in weight loss cases the initial calorie values are 1719 and 1562 respectively which has not changed significantly.

In weight gain cases although there is no statistically significant change in diet the mean values are 1893 and 1734 before and after the yoga. The calorie content of the food consumed by the weight gain cases are much higher than the other two groups.

All the patients filled up Daily diet sheets at 6 p.m. as soon as they came to the classes. Patients were encouraged to record a true statement of facts about their diet during the previous 24 hrs. The calorie content of the food recorded were calculated. The basic data are presented in the Appendix. The mean values for the day for the 4 different groups of practices were analysed separately. Fig. 4.1 depicts the destribution of the mean daily calories. The 4 curves show similar day to day fluctuations without any tendency to fall or rise during the period of study.

In summary it is interesting to observe that the reduction in PPBS and medication, the direct indicators of the state of diabetes are not simply due to the change in diet or reduction in weight. Hence the significant ehanges observed can be attributed to the independent variable. In this study the independent variable is the integrated set of yoga practices.

3.5 MEDICATION

Table 4.6 shows the analysis of changes in medication during the 4 weeks of yoga training.

Table : 4.6 Short Term Study (Whole group) Medication & 2 hrs. PPBS Analysis

		n	$\bar{x}b$	b	$\bar{x}a$	a	't'
Medication Increased Cases	2 Hrs.	5	206	67.22	187.6	21.22	0.72 NS
Medication Reduced Cases	2 Hrs. PPBS	17	181.59	66.58	171.06	52.13	2.58 *
Medication Steady Cases	2 Hrs.	50	178.4	51.61	164.1	42.12	3.99 **

(a) Medication reduced – 17 Patients had reduced their medication and in this group the PPBS fell significantly.

(b) Medication steady – The largest number (50) belonged to this categery. In this group also the PPBS fell significantly. Mean before and after were 178 to 164 mg. %

Table: 4.6a Whole group: Weight Steady, Medication – Steady or reduced

PPBS	$\bar{x}$ b	Sd.b	$\bar{x}$ a	sd.a	't'
	194.73	54.41	170.11	42.18	3.98**

Only 5 patients had increased their medication and their initial meanvalue for PPBS was much higher than the other two groups. Here the significant fall in PPBS from 206 to 187 could very well be due to the higher dose of the drugs taken. It is encouraging to note that 67 out of 72 patients had either reduced or not changed the dose of their drugs with a significant reduction in PPBS which again points to the benefical effects of yoga in diabetes patients. (Table : 4.6 a)

This short term study of the effect of yoga practised under guidance for 4 weeks points to the beneficial effects in reducing their medication and 2 hr. PPBS, the two important indicators of the state of their diabetes.

In a disease like diabetes where several factors can alter their state of control, we have tried to eliminate the influence of diet, weight and medication. This study has clearly demonstrated the beneficial effects of yoga after eliminating the influence of these three factors.

Beneficial effects are observed in all parameters only in the adult onset type (N=73) and not in the juvenile onset type (n=9). However we do have the example of one person of juvenile type who has shown significant changes.

4. PSYCHOLOGICAL STUDY IN DIABETES–Personality questionnaire (E. P. I. Scores) :

23 patients with Diabetes Mellitus were administered Eysenck's Personality Inventory (EPI) to assess the personality status of the persons before and after four weeks of yoga training.

There were 23 patients who filled up this questionnaire. The details (including the necessity) of testing the personality of persons undergoing yoga are described and discussed earlier (Report 10 and 11) in our studies on Asthma.

Appendix 5 gives the basic data for all 23 patients who took the test one day before and one day after the completion of the training period.

The results are tabulated in table 5.1. 2 out of 23 persons had a lie score of 6 and hence were rejected. Of the 21 patients the Extrovert score showed a mean value of 11.5 which fell to 10.6 with a 't' value not significant.

On Extrovert scale a person is considered Extrovert if score is 17+and introvert if scores are less than 7. Here initial (11.5) and final (10.6) values fall in the Ambivert group (neither introvert nor extrovert). The (t) test for the difference of the mean shows the change after yoga to be not significant.

On neuroticism scale the fall in the mean value from 14.3 to 12.6 is significant.

In neuroticism scale a score of 14+ suggest neurotic personality and socres below 4 suggest emotionally well balanced personality.

Before the commencement of yoga they belonged to the neurotic group ($\bar{x} = 14.3$) and fell remarkably to below the cut off score for neuroticism after four weeks of yoga practice.

Considering only the high score neuroticism cases, there were 13 patients with a score greater than 14 with a mean value of 17.7 before yoga. After yoga the N fell to 11 but the mean score showed no significant reduction.

From this study of personality using Eyseneck's Personality Inventory we have seen that–

(1) 2 persons were rejected because of high lie score.

(2) All 21 patients remained in the ambivert group with mean scores of 11.5 and 10.6 before and after 4 weeks of yoga.

(3) With regard to neuroticism scale significant reduction was found after yoga practices.

(4) When the patients with high scores on neuroticism were analysed no significant change was noticed in the mean value which was 17.7 and 17.8 before and after yoga but the number of patients in high neurotic group fell from 13 to 11.

Our observations in asthmatic patients using the same EPI, we had found that the neuroticism has fallen after 2 – 4 weeks of yoga. The fall in neuroticism count was

TABLE: 6.2 (b)

LONG TERM STUDY

No.	Parameters	n	xa	xa	b	a	t	
1.	Excess thirst	48	00.08	0.08	0.28	0.28	0.57	NS
2.	Excess Hunger	49	0.08	0.10	0.27	0.30	0.81	NS
3.	Other Symptoms	48	0.42	0.75	0.64	1.09	-1.86	S
4.	General Weakness	49	0.31	0.24	0.46	0.43	0.57	NS
5.	Frequency Urination	49	4.69	4.86	2.08	2.84	-0.17	NS
6.	Medication	49	10.96	22.89	11.40	10.06	0.94	NS
7.	Weight	49	64.79	69.91	9.42	14.19	0.53	NS
8.	P.R.	49	78.71	80.37	10.45	9.54	0.77	NS
9.	R.R.	49	22.12	22.37	3.22	3.78	0.38	NS
10.	B .P.(Sys)	49	131.06	127.79	21.40	15.11	1.26	NS
11.	B.P.(Dias)	49	82.57	80.57	11.66	9.18	0.97	NS
12.	Urine sugar	47	0.80	0.65	0.84	0.82	1.52	NS
13.	2 Hr.PPBS	40	207.18	198.83	78.45	70.53	0.72	NS

much more significant in those patients with high initial scores for neuroticism in patients with asthma.

In diabetic patients, the changes in the neuroticism scores are not that prominent.

5. LONG TERM STUDIES :

5.1 Patients :

(Table: 4.1) 52 patients have been followed up for 6 months to $4\frac{1}{2}$ years from the date of completion of the initial training programme. Of this, 49 were of the Adult onset type and 3 belonged to Juvenile type. There were 36 males and 13 females in adult onset type and 2 of the 3 Juvenile type were males. The age range was 28 to 72. The mean duration of diabetes was 6.3 years.

After completing the initial yoga training programme described earlier, all these persons were asked to continue their practices and report periodically for check up of their practices and assessment of their diabetic state. Those patients who had changed the system of medicine to Ayurveda or homeopathy were excluded from the study from that date onwards.

Those patients who had developed major illnesses like tuberculosis, I.H.D. leading to major upsets in their diabetic state were also excluded from that date onwards. A good number of patients from the initial programme could not be followed up because they did not respond to the follow up appointment cards sent to them on 3 occassions. House visits were undertaken to obtain the data from those defaulters not responding to the letters. A number of them could not be traced even during house visits because of change of address, which they had not initimated to us.

5.2 Discussion of results : Table 6.2b shows the results on all parameters. The mean and their standard deviation before and after the camp and 't' value for the differences are tabulated for the group as a whole.

Among the symptoms :

"General weakness" and "other symptomps" have reduced. There is no significant change in the others.

Looking at all other parameters we find that the changes, are not significant. The analysis of individual parameters seems to throw more light on the effect of yoga practices over a long period of time.

Table 6.2a gives the analysis of different parameters.

Weight : Of the 49 cases 47% (23) cases had reduced their weight and 19% had no change and 17 cases had increased their weight.

Medication : 30% had decreased, 45% had no change in medication and 25% had increased their medication per week. This included the insulin and or the oral tablets taken by the patient on an average.

Sugar in Urine : Sugar in urine was tested by Benedict's method showed a fall in 38% cases and no change in 40% with an increase in 22% cases.

2 Hr. PPBS : 2 Hr. PPBS has fallen in 60% of patients during this follow up period of 6 months to 50 months of yoga practices. Similar changes in B.P., PR and RR are shown in the Table 6.2a.

We see from this that 47% of patients had reduced their weight, 30% their medication and 60% showed decrease in PPBS.

Table 6.2(a) ANALYSIS OF ALL PARAMETERS (DM LONG TERM STUDY)

Parameters		Weight	Medication	Urine Sugar	2Hr.PPBS	BP(Sys)	BP(Dias)	PR	RR
Weight Decreased Cases	%	47%	30%	38%	60%	43%	37%	50%	35%
	n	23	13	17	24	21	18	25	17
	sb	65.04	22.69	1.38	228.63	143.33	90.89	84.96	23.41
	sd.b	8 .41	13.88	0.53	89.94	19.35	12.56	8.47	2.97
	xa	62.20	6.77	0.47	166.88	123.43	76.56	76.	20.34
	sd.a	8.20	5.55	0.47	55.07	13.49	8.91	8.84	2.46
	t								
Weight No Change Cases	%	19%	45%	40%	Data not available	23%	37%	22%	35%
	n	9	20	18	9	11	18	10	17
	xb	63.89	6.95	9.42	-	134.54	79.44	82	21.41
	sd.b	9.96	6.95	0.73	-	19.24	7.05	6	2.98
Weight Increased Cases	%	34%	25%	22%	40%	34%	28%	28%	30%
	n	17	11	10	16	17	13	14	15
	xb	64.97	9.45	0.65	174.88	113.65	75.38	77.86	20.8
	sd.b	10.36	8.61	0.92	51.86	10.96	8.01	8.96	4.05
	xa	68	20.55	1.5	244.59	128.82	87.69	87	24.8
	sd.a	10.84	9.46	0.97	71.65	11.82	34.61	8.58	3.56

Yoga : (Table 6.3) All adult onset types of Diabetes patients were grouped into 3 catogories; Yoga regular, Irregular and discontinued.

Those persons who were practising yoga regularly for more than 4 days per week were considered to be regular (N=20) and those who practised less than 3 days per week were called irregular (N=26). 3 out of 49 persons studied, had discontinued after the initial training programme.

Depending on the duration of follow up, those patients were further classified and the different parameters analysed. Table 6.3 shows the results.

Yoga regular : (R_1) 6–12 months follow up showed increase in weight from 67 kgs. to 68 kgs. which is not significant.

The fall in medication was from 15 to 8 with a P value=0.06.

PPBS fall from a mean value of 201.3 to 177, although the statistical analysis showed only a marginal value for P=0.06.

Yoga Regular : (R_2)

12 to 54 months follow up – weight showed similar increase from 65.5 to 66 kgs.

Medication fell from 15 ± 15 per week to 4.3 ± 3 per week, which shows a 't' value with a P> 0.005. Thus in R_2 group Medication and PPBS reduction are significant.

Yoga Irregular : (I_1)

6 – 12 months follow up – In I_1 the changes in weight, medication and PPBS have not reached significant levels.

Yoga Irregular : (I_2)

12 – 54 months follow up group – In this group none of the parameters show significant improvement. Rather there was an increase in medication in this category from 9.8 per week to 13 per week.

Three of the patients who had discontinued yoga – continued to take the higher doses of drugs.

It is seen from this analysis of yoga regular, irregular that there is improvement in the diabetic state as evidenced by reduced medication and PPBS when the patients practised yoga regularly for more than one year. In the first year of the practice we have noticed the tendency towards improvement although the changes in medication and PPBS have not reached significant levels.

In the irrigular group there is certainly no change in their diabetic state and after one year their drug requirement has increased.

We can now see that the results of the whole group show no significant changes because out of 42 patients 29 had either discontinued (N=3) or weee irregular (N = 26) in their yoga practices. All these 29 han no improvement at all and hense the whole group results appear insignificant.

From this study we can thus derive that persons must practice yoga regularly to maintain the benefits experienced after the initial training programme, which was demonstrable very clearly in the shore term studies. The difficulty in presevering an hour's practice daily, requires much stronger motivation that we saw in this group.

TABLE 6.3

LONG TERM STUDY — YOGA REGULAR

No.	Period in months	No.	Parameter	n	xb	b	xa	a	t	P
1.	6-12	1.	Weight	11	66.95	10.05	68.09	10.66	-1.88*	
	R_1	2.	Medication	11	15.45	14.52	8.0	8.43	1.69	0.05
		3.	P.P.B.S	9	201.33	-91.30	177.33	56.94	1.65	0.05
		4.	Urine sugar	11	0.82	0.83	0.77	0.86	1.61	0.08
2.	12-54	1	Weight	9	65.56	10.01	66.33	10.65	-0.48	NS
	R_2	2	Medication	9	15.33	15.59	4.33	3.19	2.54**	S
		3.	P.P.B.S.	6	258.5	70.2	179.2	40.7	3.78**	S
		4.	Urine sugar	9	0.78	0.82	0.5	1.08	1.10	N
3.	6-12	1.	Weight	4	62.75	10.13	60.75	8.50	1.55	NS
	I_1	2.	Medication	4	3.75	7.62	8.75	7.62	-	-
		3.	P.P.B.S.	4	239.0	93.02	229.75	61.08	0.29	NS
		4.	Urine sugar	4	1.68	0.22	1.25	0.75	1.0	-
4.	12-54	1.	Weight	22	63.18	7.91	62.23	7.61	1.45	NS
	I_2	2.	Medication	21	9.86	8.06	13.38	10.97	-1.89	NS
		3.	P.P.B.S.	17	190.12	56.21	189.82	60.68	0.10	NS
		4.	Urine sugar	20	0.67	0.74	0.48	0.64	0.88	NS

APPENDIX—1

DIABETES MELLITUS CASE SHEET

1. Date R. No.....

2. Name Age Sex Marital Status

3. Address Education :
Occupation :

4. Income (monthly) Phone : Off. Resi.

5. Diabetic from How was it detected

6. Past history (chronologically) Accidents Infections Shocks

7. Family history (in whom found) Diabetes Heart Problem B.P.

8. Symptoms (complaints) (chronologically) 1 2 3 4 5

9. Medical Examination Findings
Ht. ( ) Wt. ( ) Pulse ( ) Resp. ( ) B.P. ( )
Nature ( ) Living ( ) Aptitude ( )

10. Investigations	Done So Far	Advised Today
1. FBS		
2. PPBS		
3. Urine Sugar		
11 Treatments		
Yoga 1		
2		
3		
4		
Medicines		
1.		
2.		
3.		
4.		
Diet (Quantity-wise)		
1. Rice		
2. Chapatis		
3. Vegetables		
4. Dal		
5. Fruits		
6. Others		

FOLLOW UP

	Second Visit		Third Visit	
Due Date				
Actual Date				
	progress	advised	progress	advised
General feeling				
Weight B.P. Pulse Resp. Urine Sugar FBS P P B S Others 1. 2.				
Medicines 1. 2. 3. 4.				
Yoga 1. 2. 3. 4.				
Diet regimen (Quantity-wise) 1. Rice 2. Chapatis 3. Vegetables 4. Dal 5. Fruits 6. Others				

Short Term Study : BASIC DATA

Sl No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
01	61	M	0	08	bad	0	0	007	1	0	0	0	0	1	02	00	00	66	75	140/ 80	076	24	01 %	162	191	1926
					bad	0	0	5	1	0	0	1	0	1	02	00	00		77	130/ 60	68	20	1 %	160	198	1369
02.	53	M	+	23	good	0	0	3	2	0	0	+	+	1	0	60	-	72	85	140/110	80	16	nil	122	215	1302
					bad	0	0	0	0	0	+	0	0	1	0	00	-		83	140/ 00	84	20	traces	130	195	1093
03	59	M	0	25	good	0	0	4	4	0	0	0	0	0	3	40	80	65	66	150/ 90	100	20	2 %	305	200	1297
					good	0	0	2	0	0	0	+	0	2	3	40	80		68	170/ 90	84	20	2 %	204	201	1544
04.	40	M	0	-	good	0	0	0	0	0	+	0	0	3	1	-	-	-	73	130/ 70	80	24	1 %	250	-	2791
					good	0	0	0	0	0	0	0	0	0	0	00	00	-	70	110/ 70	80	24	75 %	152	210	1097
05.	35	M	+	08	good	+	+	8	4	+	+	0	0	1	2	00	60	65	55	120/ 19	82	24	2 %	306	218	2753
					good	+	+	5	1	0	0	0	0	0	4	00	00	-	55	120/ 70	62	24	2 %	202	185	1459
06.	58	F	0	06	good	0	0	0	0	0	0	0	0	1	2	00	00	-	52	110/ 80	80	20	2 %	190	109	1303
					good	0	0	0	1	0	0	0	0	1	2	00	00		52	110/ 80	80	20	75 %	166	200	1410
07.	32	M	0	04	good	0	0	7	1	0	0	0	+	0	3	00	00	66	49	120/ 80	84	20	2 %	306	214	2328
					good	0	0	7	1	+	0	+	+	0	3	00	00		50	120/ 80	120	24	2 %	228	210	2299
08.	36	F	+	05	good	0	0	5-6	1	+	0	0	0	1	2	00	00	61	59	104/ 70	100	20	2 %	186	172	1969
					good	0	0	5-6	1	+	0	0	0	1	2	00	00		59	104/ 70	96	20	2 %	180	174	2614
09.	46	M	0	04	good	0	01	0	0	0	0	0	0	0	00	00	40	72	72	130/80	-	-	1.5 %	176	208	1549
					good	0	0	6	0	0	0	0	0	0	00	10	40		72	120/ 70	96	20	0.5 %	157	198	1192
10.	39	F	+	08	good	0	+	8-10	0	0	0	0	0	1	1	00	00	62	64	120/ 80	80	24	1.5 %	190	200	1051
					good	0	+	8-10	0	0	+	0	0	0	0	00	00		63	120/ 80	82	20	1.5 %	162	175	480
11.	51	F	+	25	good	0	0	5	1	+	0	0	0	2	0	00	40	58	56	180/ 70	-	-	traces	120	234	1554
					good	0	0	4	1	0	0	0	0	1	0	40	20		56	160/ 60	104	18	2 %	210	204	1845
12.	62	M	+	12	good	0	0	4	0	0	0	0	0	1	1	00	00	65	57	140/ 70	80	16	Nil	100	-	1564
					good	0	0	4	0	0	0	0	0	1	0	00	00		56	150/ 80	92	16	traces	140	186	1098

Sl No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
13.	31	M	+	3/12	good	0	+	7-8	1	0	+	0	0	1	½	00	00	70	79	114/ 66	088	20	1%	164	220	1863
					good	0	+	4-5	1	0	+	0	0	1	½	00	00		78	134/ 68	80	20	.5%	155	208	1917
14	33	M	+	10/12	good	+	+	4-5	3	+	0	0	0	1	3	00	00	62	55	130/80	102	28	2%	215	-	2274
					good	0	0	2-3	1	0	0	0	0	0	2	00	00		55	120/ 70	88	20	2%	184	179	2231
15.	19	M	0	2	bad	0	+	10	2	+	+	0	0	1	0	16	54	70	51	110/ 80	96	26	5%	152	186	2491
					bad	0	0	5-6	2	0	0	0	+	0	1	16	54		53	120/ 90	100	24	1%	164	183	2154
16.	45	F	+	7	-	0	0	0	0	0	0	0	0	0	1	40	00	60	56	140/80	74	28	2%	240	227	3895
					-	0	0	0	0	0	0	+	0	0	1	40	00		60	140/ 70	82	24	75%	165	196	2120
17.	40	M	+	2	good	0	0	5-6	0	0	0	0	+	3	0	00	00	69	72	150/104	76	24	1.5%	186	200	2547
					good	0	0	5-6	0	0	0	+	0	1	0	00	00		73	120/ 80	70	22	0.5%	155	195	2085
18.	53	M	+	7	good	0	0	4-5	0	0	0	0	0	1	1	00	00	65	68	110/ 60	84	24	Nil	126	219	1814
					good	0	0	4-5	0	0	0	0	0	0	1	00	00		68	110/ 60	80	20	traces	144	199	1542
19.	63	F	+	10	bad	0	+	5-6	0	+	0	0	0	2	0	36	44	-	67	180/ 80	100	20	2%	204	182	1080
					bad	0	0	5-6	0	+	0	+	0	2	0	14	16		68	194/ 80	100	20	75%	169	196	1120
20.	48	M	0	4	good	0	0	7-8	2	0	0	0	0	1	2	00	00	67	60	140/ 90	80	20	1.5%	173	188	1620
					good	0	0	7	2	0	0	0	0	0	2	00	00		60	126/ 70	90	20	1%	166	183	1920
21.	32	M	0	8	good	0	0	5	0	+	0	0	0	2	0	00	00	64	63	120/ 78	92	22	Nil	115	192	1445
					good	0	0	5	0	00	0	+	0	1	0	00	00		64	120/ 76	72	20	Nil	120	190	0969
22.	41	M	+	13	bad	0	+	5-6	3-4	0	0	+	0	1	1	15	45	64	63	170/100	100	20	1%	160	-	1876
					-	0	+	-	-	0	0	+	0	0	0	00	00		65	130/ 86	90	20	1%	300	--	2283
23.	39	M	0	1	good	0	0	8	2	0	0	0	0	3	0	00	00	69	80	124/ 80	198	20	1%	174	210	1304
					good	0	0	0	0	0	+	0	0	0	0	00	00		79	110/ 70	60	16	nil	138	200	1272
24.	45	M	0	4	good	0	0	0	0	0	0	0	0	0	0	00	00	64	55	120/ 70	76	20	2%	189	200	1346
					good	0	0	0	0	0	+	0	0	0	0	00	00		54	120/ 60	60	10	5%	167	201	1490

Sl. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
25.	51	M	+	1/½	good	+	+	10-15	1	0	0	+	+	1	1	00	0	63	63	130/ 70	080	20	1%	170	230	1129
					good	0	0	0	0	0	+	0	+	0	1	00	0		63	140/ 90	80	10	75%	150	219	1246
26.	22.	M	0	4/12	bad	+	0	0	0	0	0	0	0	0	1	20	20	65	60	90/ 50	70	14	2%	272	215	1682
					-	0	0	0	0	0	+	0	0	0	0	20	20		59	100/ 60	76	18	2%	190	288	1644
27.	46	M	0	2	good	0	0	0	0	0	0	0	0	0	1	00	00	65	57	160/ 90	68	20	Nil	140	200	1558
					good	0	0	0	0	0	0	0	0	0	0	00	00		57	160/100	66	18	Nil	131	196	2165
28.	42	M	0	0	good	0	0	5-6	1	0	+	0	0	1	0	40	00	69	60	144/ 70	74	16	2%	265	254	1883
					good	0	0	0	0	0	0	+	0	0	1	30	00		69	148/ 84	68	18	2%	222	224	2861
29.	40	M	0	4	good	0	0	0	0	0	0	0	0	0	½	00	00	68	80	110/80	64	20	75%	170	215	1215
					good	0	0	0	0	0	0	0	0	0	½	00	00		80	110 /70	64	18	Traces	142	203	1472
30	49	M	0	2	good	0	0	2	2	0	0	0	0	0	0	00	00	66	67	100 /60	68	16	5%	149	262	1474
					good	0	0	0	0	0	+	0	0	0	0	00	00		66	112/ 74	68	16	Nil	135	211	1804
31	35	M	+	13	good	0	0	3-5	0	0	0	+	0	2	0	16	72	67	69	110/ 70	80	15	Nil	117	-	1330
					good	0	0	0	0	0	-	+	0	2	0	16	56		70	130/ 80	82	20	Nil	180	-	1644
32.	33	M	0	1	good	0	0	0	0	0	0	0	0	0	0	00	15	66	68	120/ 80	72	20	Nil	118	237	1271
					good	0	0	0	0	0	0	+	0	0	0	00	00		69	118/ 76	72	18	Mil	143	207	1509
33.	--	M	+	12	bad	0	0	6-7	0	+	+	0	0	1	3	00	00	65	60	150/ 90	76	22	-	300	-	1670
						0	0	6-7	0	+	0	0	0	0	3	00	00	-	60	160/ 74	80	20	2%	210	216	1413

COMMUNITY HEALTH CELL
47/1, (First Floor) St. Marks Road
BANGALORE - 560 001

Appendix 2(b)

D.M.LONG TERM STUDY - ADULT ONSET TYPE

Sl. no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
01	32	M	06	1	1	0	0	0	1	07	1	0	07	+1	1	66	49	084	20	120/80	2.0%	342	180	000	000	0	14/07/83
				-	-	0	0	0	0	04	2	0	21	0	1	-	50	82	24	120/80	2.5%	-	458			R	17/05/84
02	38	M	3/12	0	0	1	0	0	0	04	1	0	07	0	1		47	70	20	110/70	2.5%	250	318	320		0	18/03/80
						2	0	0	0	04	2	0	07	+1	1		49	64	20	110/68	3.5%		500			R	20/06/84
03	47	M	08	1	1	1	1	0	0	04	1	0	07	0	1	68	68	80	32	120/80	0.5%	-	147			0	06/07/80
						0	1	1	1	04	04	1	07	0	1		64	80	28	140/90	0.5%		220			I	04/06/84
04.	28	M	15 days	0	1	1	1	0	1	04	3	0	-	-	-	61	51	96	20	100/70	0.5%	200	320		GTT	0	08/11/81
						1	1	0	1	04	2	0	00	+1	1		58	100	20	110/70	0.5%	80	200			I	28/06/84
05.	28	M		1	0	0	-	1	1	06	1	-	07	-	-	71	56	80	24	120/80	2.0%		360				05/09/80
						0	1	1	1	04	1	-	07	0	1		50	90	22	130/100	1.0%		280			1	09/06/84
06.	45	F	07	0	2	0	0	0	1	04	2	1	40	0	1	60	56	74	28	140/80	2.0%		240	227			04/09/83
						1	0	0	1	09	1	01	21	+1	1		57	80	22	130/80	1.5%		300			R	17/05/84
07.	58	M	07	0	1	1	0	0	0	04	1	1	07	0	1	60	64	80	20	120/80	0.0%		142				16/09/81
						1	0	0	0	04	1	0	10	+1	1		61	74	20	120/80	0.5%		182			I	15/07/84
08.	53	F	13	1	1	0	0	0	0	04	*	0	00	1	1		55	00	20	110/80	2.0%		205				09/07/80
						2	0	0	0	10	1	1	21	0	1		55	00	20	110/80	0.0%		110			I	20/06/84
09.	52	M	07	1	2	0	0	0	0	04	1	0	07	0	1	69	73	76	22	120/ 80	2.0%						30/03/80
						0	0	0	0	04	1	0	07	0	1		70	64	20	140/80	2.0%					I	15/07/84
10	37	F	05	2	1	0	0	0	0	06	1	1	21	0	1	61	59	96	20	100/70	2.0%		100	174			04/09/83
						2	1	0	0	04	1	0	21	0	1		60	80	18	110/70	2.0%		250			I	12/06/84
11.	53	M	23	3	1	0	0	0	0	04	2	3	14	0	1	72	05	00	16	180/70	0.0%		122	215		0	11/00/83
						2	0	0	0	04	2	0	07	0	1		06	80	16	140/90	0.0%		130			R	21/06/84
12.	31	M	3/12	1	1	0	1	1	0	00	3	2	04	0	1	70	79	88	20	114/66	1.0%	140	164	220			10/10/83
						0	0	0	0	04	3	0	04	0	1		82	82	18	120/80	0.5%		160			R	19/05/04

Sl No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
13.	34	M	6/12	0	2	0	0	0	0	04	2	0	07	0	1	-	65	090	24	120/80	0.5%	110	184	000	000	0 0/07/80
						2	0	0	0	04	1	0	14	0	1	-	62	84	24	110/70	2.0%		216			I 18/05/84
14.	39	M	2/12	0	0	0	0	0	1	10	1	2	00	0	1	69	79	60	16	110/70	0.0%		130	200		08/10/83
						0	0	0	0	04	1	0	00	0	0		79	80	22	130/70	0.0%		105			R 22/05/84
15.	40	M	2	1	1	0	0	0	0	06	1	2	00	0	1	68	78	76	24	150/104	1.5%		186	200		04/09/83
						0	0	0	1	04	1	0	00	0	1		73	82	24	140/100	0.5%		155	195		I 15/07/80
16.	63	F	10	1	7	0	0	1	1	06	1	4	21	0	1		68	100	20	180/80	2.0%		204	192		06/08/83
						3	0	0	1	04	2	3	21	0	1		69	80	20	180/80	2.0%		218	185		R 04/05/84
17	39	F	08	1	2	0	0	1	0	10	2	0	07	0	1	62	64	80	24	120/80	1.5%		190	175		04/09/83
						0	0	0	0	04	3	0	07	0	1		61	0	20	110/70	0.5%		196			I 30/05/84
18,	43	M	02	0	0	0	0	0	0	04	1	0	07	0	1		77	100	24	140/100	0.0%	106	200			30/12/79
						0	0	0	0	04	3	0	14	0	1		70	94	22	110/70	0.0%		214			S 09/06/84
19.	49	M	03	0	2	0	0	0	1	04	1	1	30	0	0	63	61	80	20	150/90	0.5%					23/11/82
						0	0	0	0	04	1	0	40	0	1		60	80	20	150/100	0.0%					I 26/06/84
20.	42	M	05	0	0	0	0	0	1	04	3	0	07	0	0		50	00	20	120/80	1.5%	250	400	207		20/09/83
						0	0	0	0	04	3	0	07	0	1		49	72	20	110/70	2.0%	145	310			I 12/07/84
21.	42	F	06	1	2	0	0	0	0	00	1	8	14	0	1		65	00	22	150/90	0.0%	100	250			15/01/80
						2	0	0	0	00	2	0	35	0	1		69	82	24	130/70	1.5%		265			I 12/07/84
22.	45	F	02	1	2	1	0	0	0	00	0	1	07	0	1		54	02	20	120/80	nil	132	150	231		30/06/80
						1	0	0	0	04	1	1	07	0	1		55	88	24	120/80	0.5%		250			D 12/07/84
23.	41	M	04	1	3	0	0	1	0	00	0	2	07	0	1		78	70	24	130/90						04/07/80
						3	0	1	1	07	1	0	21	0	1		84	80	20	150/90						D 27/06/84
24.	46	M	04	1	2	1	0	0	0	00	0	2	10	0	2		70	84	22	150/90	1.5%	250	350			13/04/82
						1	0	0	0	05	1	1	07	0	1		60	80	24	120/80	0.5%		100			R 20/06/84
25.	57	M	12	1	2	0	0	0	0	07	1	1	21	+	1	65	60	76	20	170/100	2.0%		300	216		20/10/83
						1	0	0	0	05	1	2	07	0	1		56	68	22	130/70	1.0%		217	217		R 21/06/84

Sl No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
26.	30	F	1	Wk.	0	2	2	0	0	0 04	2	1	00	0	0	60	63	086	24	100/70	0.0%	130	150	000	000		26/08/81
							2	0	1	0 04	2	1	00	+1	1		65	90	20	120/80	0.0%	60	110			I	20/06/84
27.	36	M		04	1	0	1	1	0	0 05	0	0	07	0	1	64	76	80	22	120/80	0.0½/		125	170			18/03/81
							0	0	0	0 05	3	0	21	0	1		78	100	20	130/90	0.0%		110			I	02/07/84
28.	62	F		09	3	0	0	0	0	0 04	2	0	21	0	1	63	52	86	22	140/80	1.0%		221	312			10/03/81
							0	0	0	0 04	1	0	29	0	1		52	80	20	130/80	0.5%		100			I	02/07/84
29.	50	M		29	4	4	0	0	0	0 04	3	0	07	0	1		72	102	22	160/108	8.5%		190				13/07/80
							0	0	0	0 06	1	1	07	0	1		72	100	16	120/80	0.5%		180			I	28/06/84
30.	50	M		10	0	0	1	0	0	0 04	3	0	21	0	1	67	71	86	24	130/84	2.0%		200	203			09/11/81
							1	0	0	0 04	1	0	14	0	1		70	100	20	112/90	2.0%		250			I	29/06/84
31.	33	M		01	0	1	0	0	0	0 04	3	1	00	0	0		77	80	24	90/60	1.0%		250				23/01/82
							0	0	0	0 00	2	0	00	0	1		75	80	24	130/60	0.0%	60	170			R	28/06/84
32.	59	M		02	1	0	0	0	0	0 04	3	2	00	1	0		63	80	24	150/90	0.0%	170					03/07/80
							5	0	0	+ 20	3	2	14	0	1		60	80	24	140/80						I	11/06/84
33.	40	M		04	0	0	1	0	0	0 04	3	0	14	0	0		72	90	24	130/80	1%		156				01/10/80
							0	0	0	0 04	3	04	07	0	1		71	80	20	130/80	0.0%					I	13/06/84
34.	33	M		01	1	0	2	0	0	1 04	1	2	42	0	1	66	68	72	20	120/80	nil		118	237		R	13/09/83
							0	0	0	1 07	1	0	00	0	1		70	80	30	140/70	-		120	200		R	09/06/84
35.	72	M		06	4	0	2	0	0	1 04	1	2	21	0	1		60	80	20	150/84		05	130	260	B.Ur		15/03/81
							1	0	1	0 84	1	0	07	0	0		60	68	16	150/80		80	110	227	44Mfg	R	17/05/84
36.	54	M		07	2	0	0	0	0	0 04	1	0	07	0	1	62	52	100	20	140/100	0.5%	206	180				01/07/80
							0	0	0	0 04	1	0	84	0	1		52	100	18	120/80	0.5%		310			I	09/06/84
37.	42	M			0	0	2	0	0	0 06	3	1	21	0	1	69	68	74	16	114/70	2.0%	172	265	254			08/09/83
							2	0	0	0 04	1	0	07	0	1		68	90	22	120/80	1.0%	115				R	12/06/84

Sl. No.	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
38.	65	M	20 0	0	1	0	0	0	04	1	2	07	0	1		66	80	30	130/90	1.0%		320			R	28/04/82
				0	0	0	0	00	3	0	07	0	1		79	74	30	140/90	0.0%		250			R	05/06/84
39.	49	M	10 1	3	0	0	0	0	04	1	07	14	0	1	68	74	80	24	150/80	0.0%	000	107	356	000	0	01/07/80
				0	0	0	0	04	1	00	07	0	1		74	78	26	130/80	1.5%		221	250		D	05/06/84
40.	40	F	02 1	1	2	0	0	0	04	1	02	24	0	1	66	61	80	80	180/120	0.0%	160	240		Bur		14/08/81
				2	0	0	0	04	1	01	24	0	1		60	70	30	150/90	0.0%		163		26Mg	I	05/06/84
41.	34	M	4/12 0	0	0	0	0	0	04	3	00	Nil	0	0	64	65	88	20	140/80	0.0%		126	180			20/08/83
				0	0	0	0	04	2	00	Nil	0	0		68	80	24	140/90	0.0%		120			R	01/06/84
42.	59	F	01 3	0	0	0	0	0	04	1	00	U	0	0	61	58	100	24	120/80	0.0%	85	160				03/03/82
				0	0	0	0	0	04	1	00	0	0	1		58	76	20	140/90	0.0%		120			I	26/05/84
43.	-	M	20 0	1	0	0	0	0	04	1	00	3	0	1	59	63	80	26	150/90	0.0%		130				16/03/83
				0	0	0	1	0	04	1	00	3	0	1		62	72	30	140/90	0.0%	78	129			I	26/05/84
44.	38	F	02 0	1	0	0	0	0	03	1		3	0	1	59	50	80	26	120/80	0.0%		140				22/10/82
				1	0	0	0		04	2	00	3	0	1		50	74	28	120/80	0.5%		190			I	25/05/84
45.	31	F	03 0	0	0	0	0	0	04	1	00	07	0	1		52	80	20	120/80	0.0%	130	230				02/07/82
				1	0	0	0	0	04	3	00	07	0	1		49	80	20	110/80	0.5%		187			R	21/06/84
46.	56	M	1	1	1	0	0	0	04	1	01	04	0	1	67	73	80	20	160/100	1.0%	280					20/05/85
					1	0	0	1	08	1	00	14	0	1		73	62	20	140/90						0	15/07/84
47.	55	M	02 1	0	1	0	0	0	10	0	00	14	0	1	-	68	80	20	120/80			270				10/09/82
				0	0	0	0	0	04	1	01	00	0	1		61	64	24	130/70	0.0%		178			R	26/06/84
48.	30	M	00 0	3	0	0	0	0	04	2	00	00	0	0	65	61	80	20	104/80	0.0%		400				26/06/83
				0	0	0	0	0	04	2	00	00	0	1		64	80	20	100/70	0.0%	106	193			R	30/05/84
49	61	M	08 1	0	0	0	0	0	07	1	11	56	0	1	66	77	65	20	130/60	Traces		160	198			04/09/81
				0	0	0	0		04	2	00	00	0	1		76	72	24	110/70						R	27/05/84

APPENDIX -3

DM LONG TERM STUDY ADULT ONSET TYPE

DESCRIPTION OF PARAMETERS USED IN THE STUDY

Column No.	Parameters
Sl.No.	Serial Number
01.	Age
02	Sex(F:Female; M:Male)
03	Duration of Diabetes
04	Previous History
05	Family History
06	Symptoms
07	Thirst
08	Hunger
09	General Weakness
10	Urine frequency
11	Weight loss or steady or Increased
12	Other ailments
13	Medication/week
14	Change of drugs
15	Diet
16	Height
17	Weight
18	Pulse rate (PR)
19	Respiratory rate (RR)
20	Blood Pressure(BP) (Sys./Dias)
21	Urine sugar %
22	Fasting Blood sugar (FBS...mg)
23.	2 Hours Post prondial blood sugar mg)
24.	Blood cholesterol (....mg)
25.	others
26.	Yoga:R-Regular, I-Irregular S-Stopped, D-Discontinued
27	Date of visit (before & after)

TABLE
D.M. SHORT TERM STUDY : JUVENILE ON-SET

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1.	19	M	+	2	Bad	0	+	10	2	+	1	0	16	54	5'10"	511	110/80	96	26	0.5	152	186	2491
					BAd	0	0	5-6	2	0	1	0	16	54		551	120/90	100	24	1	164	183	2154
2.	32	M	-	3	good	0	0	5	0	+	2	0	0	0	5'4"	63	120/78	92	22	Nil	115	192	14 5
					good	0	0	5	0	0	1	0	0	0		64	120/76	72	20	Nil	120	190	965
3.	22	M	-	4/12	bad	+	0	-	-	-	0	+	20	20	5'5"	60	98/58	70	14	2	272	215	1662
					-	-	0	-	-	-	0	0	20	20		59	100/60	76	18	2	198	208	1644
4.	35	M	+	13	good	0	0	3	0	-	0	0	16	72	5'7"	68.5	110/70	80	15	Nil	117	---	1330
					good	0	0	n	n	-	0	0	16	56		70	130/80	82	20	Nil	180	-	1644
5.	51	F	+	25	good	0	0	5	1	+	1	0	20	40	4'10"	56	130/70	104	18	traces	120	234	1554
					good	0	0	4	1	-	1	0	20	50		56	160/60	104	18	2	210	204	1845
6.	22			9	good	0	-	-	-	-	1	+				53	100/60	72	16	-	168		
					bad							-				52	110/70	80	20		110		
7.	37			11	good						1					46.5	120/80	78	20		230		
					good						1					47	100/70	70	20		160		
8.	19			14	bad											50	120/80	84	23		195		
					bad											40	110/60	68	20				
9.	27			7	good											48	110/60	68	20				
					good											48	110/60	66	18		--		

APPENDIX-4

SET OF YOGIC PRACTICES USED FOR PATIENTS WITH DIABETES MELLITUS

I (A) Breathing Exercises
1) Tiger Breathing (10)
2) Rabbit Breathing (15 Secs)
3) Sasānkāsan Breathing (10)

(B) Sithilikarana Vyayama (Loosening Exercises) :
1) Jogging – Normal (100)
– Front (20)
– Side (20)
2) Forward & Backward bending (10)
3) Side bending (10)
4) Twisting (10 each side)

(C) Surya Namaskaras (12 counts – 3 times)

II ASANAS :

(A) Standing Postures :
1) Ardha Kati Cakrāsana ($\frac{1}{2}$ to 1 mt. each side)
2) Ardha Cakrāsana ($\frac{1}{2}$ to 1 mt.)
3) Pāda Hastāsāna (2 to 3 mts.)
4) Relax in Savāsana (10 breaths)
5) Parswa Konāsana

(B) Prone postures (Lying on the abdomen)
1) Salabhāsana ($\frac{1}{2}$mt.)
2) Dhanurasana ($\frac{1}{2}$ mt.)
Relax in Makarasana (1 mt.)

(C) Supine Postures (Lying Down on back)
1) Viparita Karani (3 mts.)
2) Sarvāngāsana (3 mt.)
3) Matsyāsana (1 mt.)
4) Halāsana (1 mt.)
5) Cakrāsana ($\frac{1}{2}$ mt.)
Stretch & Relax in Savāsana (3 mts.)

(D) Sitting Posturcs :
1) Vakrāsana 2 times
2) Ardha Matsyendrāsana (1 mt. each side)
3) Sasankāsana or Yoga Mudra

III (A) SECTIONAL BREATHING
– Abdominal (9)

(B) Kapāla Bhāti (1 mt.)
Agnisāra

(C) Prāṇāyāma
1) Bhastrika (2 rounds)
2) Nadi sudhi
3) Bhrāmari

(D) OMKAR (3 times)
(E) Dhyāna

IV KRIYAS
1) Vamana Dhouti 2) Vastra Dhouti 3) Saṇkha Praksālana

APPENDIX - 5

BASIC DATA : E. P. I. SCORES

	BEFORE				AFTER			
Sl.NO.	L	E	N	TOTAL	L	E	N.	TOTAL
1.	2	7	18	27	1	9	18	28
2.	4	16	13	33	6	15	19	40
3.	3	7	11	21	3	8	12	23
4.	4	10	6	20	5	11	10	26
5.	6	11	5	22	4	10	3	17
6.	3	8	23	34	4	13	20	37
7.	4	11	20	35	3	9	13	25
8.	6	7	10	23	4	8	4	20
9.	5	12	5	22	4	8	4	16
10.	5	11	12	28	2	12	6	21
11.	3	9	14	26	4	11	6	21
12.	3	10	15	28	4	11	12	27
13.	2	18	20	40	5	13	16	34
14.	5	12	14	31	5	12	13	30
15.	5	11	2	18	6	10	1	17
16.	2	10	22	34	5	11	22	38
17.	4	13	9	26	2	15	5	22
18.	2	14	17	33	1	10	17	28
19.	2	13	16	31	3	14	17	34
20.	3	11	14	28	3	10	10	23
21.	3	13	21	37	2	12	15	29
22.	6	17	14	37	2	8	15	29
23.	1	9	13	23	3	8	11	22

Note: * L = Lie score, E = Extroversion, N = Neurotic.

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